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ON THE ENVIRONMENT

Athens, 25-27 April 1984

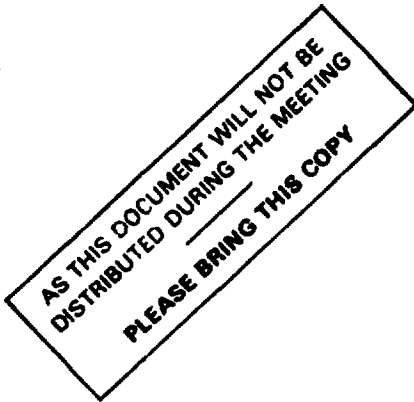
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COASTAL AREAS, RIVER BANKS AND LAKE SHORES :  
THEIR PLANNING AND MANAGEMENT IN COMPATIBILITY  
WITH THE ECOLOGICAL BALANCE

Report presented by the Delegation of Greece

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## FOREWORD

The Committee of Senior Officials responsible for the preparation of the 4th European Ministerial Conference on the Environment, to be held from 25 to 27 April 1984 in Athens, Greece, has defined the theme of the Conference as follows :

"Coastal areas, river banks and lake shores : their planning and management in compatibility with the ecological balance" (1)

The present report, drafted by the delegation of Greece<sup>(2)</sup> is based on an analysis of national contributions drawn up along the lines set out in document MEN-4-HF 12, and subsequent observations and comments by the national delegations. The delegation of Greece wishes to express its gratitude for their precious cooperation.

The report consists of two parts :

Part A presents a broad survey of coastal areas, river banks and lake shores in the Council of Europe member States.

Part B attempts to formulate a policy which should be implemented to ensure the maintenance of the ecological balance in these areas.

A number of appendices, summarising information provided by the national delegations, completes the report.

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(1) Doc MEN-4-HF 9

(2) The report was prepared by a team set up by the Ministry of Housing, Planning and the Environment under the coordination of Dr Marios Camhis and the participation of Dr E. Economidou, A. Katsaounis, D. Margaritoulis, L. Moraitou, Dr C. Savakis, D. Spala, G. Petrakakis, Dr A. Zarkanelas.

## A. THE PRESENT SITUATION

### 1. THE ENVIRONMENT OF COASTAL AREAS, RIVER BANKS AND LAKE SHORES

#### 1.1 GENERAL CHARACTERISTICS

Europe, one of the smallest continents, has an extraordinary variety of coasts, which were formed when the land was cut into islands, peninsulas, etc., and is surrounded by various seas. Seventeen of the twenty-one member States of the Council of Europe have coastlines : four of them are exclusively Mediterranean (Cyprus, Greece, Italy, Malta), one is Mediterranean-Black Sea (Turkey), one is both Mediterranean and Atlantic (Spain), one is Atlantic-Mediterranean-North Sea (France) and the others are washed by the Atlantic, the North Sea or the Baltic.

In the Federal Republic of Germany, Denmark, the Netherlands and Belgium, coastal areas are long, flat, regular and relatively homogenous ; elsewhere in western Europe they are more heterogeneous, whilst in southern and northern Europe they are generally steeper, with mountains falling directly into deep seas. Norway and Sweden in particular are characterised by rocky coasts and huge moraine formations.

A general and fairly recent rise in the sea level formed the more or less steep, rocky coasts around old mountain chains. These coasts are often cut into rias or are shaped by glaciers into fjords. At the same time, tectonic movements in the Mediterranean led to the formation of a varied coastline and countless islands, especially in the eastern basin.

Rivers, streams and lakes in Europe are also of an impressive variety. The rivers in the mountainous countries of Europe are in general small and fast with narrow mouths, whilst in the lower countries they are longer and larger, with extended deltas and estuaries. Most of the lakes are of glacial origin (Scandinavia, Baltic, Alps) or karstic (southern Europe).

Coasts, banks and shores are all transition zones or, more scientifically, ecotones. An ecotone combines the characteristics of the two communities it separates and often contains a great abundance and diversity of organisms as well as a very high productivity. Coastal areas, banks and shores are ecotones between terrestrial and aquatic biocenoses.

In Europe these areas contain a very rich flora and fauna, and an impressive biocenotic zoning. Along the European coastline and on stable substrates there is firstly an area of coastal marine waters where brown algae predominate, such as *Pelvetia* sp, *Ascophyllum* sp, *Fucus* sp, *Ectocarpus* sp, and where are also found green algae, sea anemones, sponges, molluscs, fish, etc. On sandy substrat there are beds of various species of monocotyledons (*Zostera*, *Posidonia*, *Cymodocea*) and polychaetes. These areas are often influenced by tides and *Spartine* sp is dominant in large parts of it. These biocenoses are followed by ammophilous biocenoses, often in a terrestrial environment. In the dunes and on sandy beaches grow typical plant species : *Ammophila arenaria* (marram grass), *Agropyron junceum*, *Cakile maritima* (sea rocket), *Eryngium maritimum* (sea holly), *Euphorbia paralias*

(sea spurge), etc. Wetlands (lagoons, marshes, etc) are situated behind the dunes and the beaches. Here are found plants of the genus Ruppia, Salicornia, Juncus, Limonium, Atriplex, Suaeda, etc. and several typical bird species, such as Podiceps, Pelecanus, Ardea, Egretta, Anas, Calidris, etc. On rocky coasts chasmohalophytes (Crithmum maritimum, Armeria maritima, Limonium spp, etc.) can be found and gulls (Larus spp) may nest.

#### a. Estuaries and deltas

The differences between marine coasts, river banks and lake shores are caused mainly by the different characteristics of the water. There is, however, an area where these systems (marine coasts and riparian areas) meet : river mouths, estuaries and deltas. In Europe these sites are extremely complex, delicately balanced, and have fragile ecosystems. The largest estuaries and deltas are situated along the coasts of the Federal Republic of Germany and the Netherlands as well as along the Atlantic and North Sea coasts of France and Great Britain. There are no estuaries in the Mediterranean because the natural conditions (ie the absence of tides) do not encourage this formation. The main Mediterranean deltas are those of the Rhône in France and the Pô in northern Italy.

Estuarine communities are composed of a mixture of endemic species, those which come from the sea and a few species capable of passing to and from the freshwater environment. Some species such as salmon and eel also depend on estuaries in transition periods during the migration from salt to fresh water. The abundant detritus and phytoplankton support commercially important populations of filter-feeding molluscs, such as scallops, oysters and so on. The estuaries contribute directly to the productivity of commercial and recreational fisheries and they are valuable nursery areas.

One of the reasons for the high productivity of estuaries and deltas is that they are nutrient traps creating a sort of "self-enriching" system. The estuaries and their adjacent marshes and ponds provide habitats for many species of migrating and nesting waterfowl and numerous shorebirds, which are affected by the destruction of submerged plant communities and excessive disturbance from surrounding development and heavy motor boat traffic.

Most of the north European estuaries and deltas have been transformed by large regulating works, such as dams, dykes and canals which have to a large extent affected their ecological characteristics. They are highly polluted, as enormous quantities of a wide variety of pollutants are carried in the rivers Rhine, Meuse, Schelde, Elbe and others which serve almost the entire - highly industrialised - centre of Europe. Similar conditions, although to a lesser degree, exist in most of the Mediterranean river mouths. The estuaries and deltas have been used for water management, navigation, industry, agriculture, mariculture and recreation.

#### b. Wetlands

Vital components of the coastal environment are also the coastal (saltwater) wetlands. They support waterfowl, nourish marine life, cleanse the waters of the coast, diminish storm flooding and beautify the shore.



They include salt marshes, swamps, lagoons, meadows, ponds, flat lowlands subject to the influence of coastal waters. They are periodically exposed and flooded by salt or brackish water through tide and normal storm action. Coastal wetlands also provide a buffer between open water and the shoreline and can be effective in preventing erosion along unconsolidated shorelines.

Special cases of coastal wetlands are intertidal marshes, which are affected by the tidal waters, and the lagoons. Tides are negligible along the Baltic with the exception of Denmark, which reported an intertidal zone of about 840 km<sup>2</sup>. The Wadden Sea, which extends from Den Helder in the Netherlands along the entire North Sea coast in the Federal Republic of Germany as far as Esbjerg in Denmark, is an intertidal zone of particular importance. It covers in all an area of 7,300 km<sup>2</sup>. The Dutch part comprises 2,300 km<sup>2</sup>, the German part 4,500 km<sup>2</sup> and the Danish part 500 km<sup>2</sup>. Spain, France and Great Britain, on the Atlantic and North Sea coasts, also have significant intertidal zones (300 - 500 km<sup>2</sup> for France). The Mediterranean is in general considered to be tideless (only a few centimetres, with the exception of the north Adriatic where the tides are greater (spring tides : 94 cm).

Lagoons are large bodies of open, shallow water which are protected from oceanic forces by a barrier beach. Lagoon environments are important sites for marine organisms and are very rich in terms of organic productivity. Many marine species require lagoon habitats to survive, since they spend a portion of their lives there. Lagoons are found throughout the European continental shore and occupy, in some cases, large areas. The total area of the north European lagoons is estimated to be about 400,000 ha, most of which is restricted to the North Sea. The Mediterranean lagoons cover about 250,000 ha.

Coastal wetlands have historically been filled in or dredged to accommodate the needs of human settlements, agriculture and industry all over Europe. The transformation of salt marsh wetlands continues today for agriculture, industry and recreation.

#### c. Beaches and sand dunes

Beaches and sand dunes are also important natural systems in the coastal area. The beach is a constantly changing environment and provides a natural buffer zone between the sea and upland areas. Beaches and especially sand dunes and barrier beaches are fragile ecosystems vulnerable to man's activities. Many important birds, reptiles and other animals nest and breed on beaches and dunes, and feed and rest there. For example, turtles come ashore during the spring and summer to lay their eggs above the highwater line. Terns and other seabirds frequently lay their eggs on the beach.

Sand dunes are well-known formations, particularly along open, exposed coasts. Thus Norway and Sweden have few or no sand dunes. Denmark has quite extensive sand dunes, while in the Netherlands they are also well developed. By far the most extensive dunes can be found along the French coast where they cover an area of about 250,000 ha. In the Mediterranean, Turkey has the most extensive sand dune systems (nearly 110,330 ha). Beach problems are caused by human actions. Normally, if nothing is built on or

near the beach, it will remain as long as the process of natural replenishment continues. Since the main threat to the beach is usually from development on the land next to it, beach protection requires coordinated management of the beach itself and the land behind it. Sand dunes need to be protected so that they may continue to lessen the force of stormy seas, and furnish nesting areas and valuable habitats for certain wildlife species.

d. Other terrestrial ecosystems

Other types of terrestrial coastal ecosystems which can be distinguished in Europe are :

- a. Coastal heathlands, bushes and degraded formations
- b. Coastal forests
- c. Rocky shores.

The Scandinavian countries (Norway, Sweden) have mainly ecosystems of rocky shores, bushes and forests. A high percentage of the shores in the Mediterranean countries is rocky (eg Malta 60%, Greece 70%) while France has an equal distribution of different ecosystems, because it is surrounded by different seas. Coastal forests exist mainly in the Scandinavian countries, in Portugal and the Atlantic part of France. Some of these forests are threatened by tourist development, over-exploitation and fire. Rocky shores are also threatened by rock extraction and the construction of roadways. The heathlands and the bushes are also threatened by clearing for agriculture or weekend houses.

e. Marine ecosystems

The marine environment on the coast extends to the upper high-water levels, with the range of the tide defining the limits of the intertidal shore. From the shore seawards, the marine environment can be classified into near-shore and offshore zones. For describing typical near-shore processes the depth of the zones is usually set at 10 metres. The basic substratum on the near-shore floor may be composed of rocks, sands, silts and clays, with some organic fragments such as shell deposits.

There are many important ecosystems in the near-shore zone, such as deep holes, kelp beds, seagrass beds and fishing banks. The seagrass beds supply food to grazing animals and detrital nutrients to the water. They add oxygen and stabilise bottom sediments. They provide nursery areas because they attract a diverse and prolific biota and often create unique opportunities for the existence of certain species.

Millions of people spend a great deal of time and money on coastal swimming, fishing, boating and surfing. However, municipalities and industries use coastal waters for waste disposal. They are frequently useful for cooling or other industrial processes.

f. Particular types

Norwegian fjords form a particular coastal type in Europe. A typical feature of these fjords is that they often have more than one threshold. These thresholds may impede the natural circulation of the inner water masses, thus creating special biological conditions and temperatures in the fjord.

Fjords exist also in eastern Jutland in Denmark, in Ireland and in Scotland. Other particular types are reported by Sweden, where the bedrock and moraine archipelagos with many islands, peninsulas and bays are very characteristic of the Baltic Swedish coasts. Finally, polders exist mainly in the Netherlands (45%), in Belgium and on a very small percentage (1%) of Ireland's coasts.

#### g. Rivers and lakes

Freshwater habitats are generally divided into flowing water systems (streams and rivers) and still water (ponds and lakes). These environments are characterised by water salinity below 0.1 ppt, no tidal influences, and rainfall and groundwater as the only water sources.

The riparian area contains important terrestrial and aquatic ecosystems depending on the condition of the banks (natural or not). The various types of terrestrial and aquatic ecosystems vary greatly in length.

Waterfalls are widespread in the Scandinavian countries and in Switzerland. As regards lake shores, thickets of reed, marshes and wet meadows are the most commonly found types of terrestrial ecosystems, while most of the lakes could be characterised as eutrophic or mesotrophic. The most valuable part of river bank and lake shore systems is an upper edge-zone (an ecotone) where the top of the bank changes abruptly into the inland landscape. When characterised by a strikingly different mixture of trees and bushes, the edge-zone provides habitat conditions not found elsewhere inland, and therefore attracts a special community of birds and other animals. Bank tops that merge gradually inland, with a barely perceptible edge-zone, may be of lesser ecological value. Strips of natural vegetation between open fields and water bodies are important for wildlife habitat and water quality protection.

#### h. Artificial lakes and canals

The shores of artificial lakes and canals form a particular kind of freshwater habitats. Most artificial lakes are used either for hydro-electric power production or for drinking water supplies. The ecosystems found along their shores and those of canals are not generally of high value as habitats, but occasionally can constitute very important biotopes for birds, especially after the destruction or reduction of a neighbouring wetland.

#### i. Protected areas

All Council of Europe member States have many protected areas which cover a wide variety of biotopes and species : the Wadden Sea tidal flats in the North Sea and the nesting beaches of the turtle in the Mediterranean demonstrate the tremendous variety of Europe's biotopes. Protection ranges from adequate (ie fully covered by legislation) to insufficient (ie a protection announcement or resolution with no legal backing). The biotopes of some endangered species (eg the monk seal) are not adequately protected. A number of biotopes have been declared of international importance according to the Ramsar Convention, but this in itself does not ensure that these biotopes are sufficiently protected.

In spite of their protection status, protected areas also suffer from the effects of human activities. Man-made alterations and disturbances of the ecological processes of the surrounding regions influence, gradually, the protected biotopes.

## 1.2 ECOSYSTEMS DEGRADATION

The early settlers in Europe found a land of physical beauty and fertility. In their efforts to ensure their survival, they cleared the forests, tamed the rivers with levees and dykes and hunted wild animals. Men also preferred to settle at, or near, the water's edge from earliest times onwards. This is shown by the strong tendency to coastal concentrations and high population densities along rivers. Even in this century, the high productivity and natural values of inland and coastal wetlands have often not been appreciated by man, who frequently considered them as "worthless", useful only if drained, ditched, filled in or used for construction or other alien purposes.

However, it was only after the Second World War that the rate of degradation accelerated, with the development of industry and tourism and the expansion of coastal settlements. Flat coasts are, to a much greater extent than steep ones, influenced by the building of ports, marinas, airports and tourist installations. The degradation of aquatic ecosystems is mainly due to pollution originating from ports and industrial installations as well as from residential areas. The degradation of ammophilous ecosystems is caused by sand extraction, road construction and recreational and tourist activities. All the above disturb these ecosystems severely and favour the effects of wind and marine erosion. In the Mediterranean, the destruction of coastal forests was mainly caused by fires and tourist activities. The rocky coasts have been disturbed by the building of coastal roads and site preparation for tourist purposes.

As regards the riparian forests, it seems that their reduction in area is mostly caused by technical works to provide space for agricultural land and residential areas, or for tree plantations for industrial use. As regards reed beds, marshes, water meadows and bushes, these have been degraded by changes in land use for the benefit of agriculture and cattle raising and by pollution.

The degradation of lake ecosystems is principally due to excessive construction and recreation as well as pollution. Lake ecosystems are used at present for residential, industrial, recreational and agricultural purposes. Present threats upsetting the ecological balance in lake ecosystems are pollution from land-based sources, land reclamation, regulating works and acid rain.

The increase in human population in coastal areas and on river banks and lake shores has led to the destruction or degradation of biotopes and the modification of landscapes. This is the essential cause of the decline of populations of endemic and rare species of flora and fauna. Other causes are pollution, collection (plants and animals, mainly mammals and birds), uncontrolled hunting, tourism and urbanisation.

Large coastal areas are already affected by steel works, refineries, manufacturing industries, etc. Discharges from these industries as well as from municipal sewage treatment plants, and excessive fertilisation from agriculture and forestry have influenced the aquatic ecosystems along the European coasts. Reduced annual fish yields could be attributed to this situation. In most, if not all, rivers several types of hydraulic works have been carried out. This has resulted in a considerable alteration and in some cases degradation of the riparian ecosystems. River banks in a natural state are not extensive, although the percentage rises in the less developed countries.

Terrestrial ecosystems are mainly influenced locally by industry and harbour structures and by excessively intensive recreational settlements. Both terrestrial and aquatic ecosystems are threatened by oil pollution from different sources, which has many times caused serious losses to plant and seabird populations and each time requires expensive cleaning-up operations.

Man's intervention in Europe has also been responsible for the sudden disturbance of the balance between the phenomena of erosion and deposition. Intensive construction along the coasts, due to the high concentration of human settlements and industries, has in some areas caused a complex system of chain reactions which are difficult to control. Development in coastal areas, on river banks and lake shores has led to the destruction of estuaries, wetlands, beaches, forests and other ecosystems, and consequently to a reduction in and change of the fisheries' catch. If present trends continue, the increase in human population density and industrial and commercial activity will have yet more substantial effects on the biological productivity of the coastal and riparian ecosystems. Finally, areas of scientific and recreational value, with many important animal and plant species, will be lost forever.

## 2. PLANNING, ADMINISTRATION, LEGISLATION, EDUCATION, INFORMATION, RESEARCH

A considerable effort has been made during the last fourteen years, since European Conservation Year 1970, especially in the more developed countries for the protection and rational management of coastal and riparian environments. New legislation has been adopted ; plans, programmes and research have been carried out in many fields, new administrative structures have been established and coastal and riparian areas have been designated as protected areas.

At international level, new programmes and policies have been developed and conventions, protocols and other legal agreements have been concluded by the member States concerned.

### a. Planning

In the field of planning and management, the problems of coasts, rivers and lakes have in general been tackled within the framework of the overall regional, urban or environmental plans and programmes. In addition, several countries, in particular those with a long experience of the impacts of industrialisation and urbanisation, have decided to draw up and implement special plans and programmes for the development and protection of their coastal and riparian areas (Appendix 8).

Certain countries have prepared, or are in the process of preparing, coastal, river or lake plans of a general nature, such as the coastal regional plans and sea use plans in France ; the indicative coastal use plans in Spain, and the lake plans in the Federal Republic of Germany. The Netherlands have a long history of a systematic approach to coastal development - a life and death issue for more than half of the total population of that country.

The preparation of plans and programmes specifically geared to the protection of the environment or of sectoral plans has been more widespread. Such programmes refer to the identification, classification, protection, management and in certain cases, acquisition by the State or other bodies, of specific coastal, lake shore or river bank sites. Examples of such programmes are : the Heritage Coast Programme in Great Britain in 1966, which was followed by Enterprise Neptune : the Programme of acquisition of coastal sites in France by the Conservatoire du Littoral ; a plan for the rational use of marine resources in Sweden ; a pollution control programme for lakes and watercourses in Norway, etc.

The experience gained during these last few years has proved to be useful not only in confronting, at least, some of the problems of coastal and riparian areas, but also in accepting the necessity of an integrated approach to planning and management.

#### b. Administrative arrangements

The complexity and multiplicity of uses in coastal and riparian areas, as well as the existence of two different systems - land and sea - have unavoidably led to the dispersion of responsibilities for planning, management and control among a variety of authorities.

Authorities in charge of environmental protection and nature conservation, the merchant navy, public works, fisheries and agriculture, public health, defence, tourism, etc. have diverse and often overlapping responsibilities for the sea and water areas. An even greater number of authorities or agencies, even within the same ministry, have control over the terrestrial, coastal and/or riparian issues. The lack of coordination which often results from the conflict of responsibilities has been a serious obstacle to effective implementation and control.

Certain countries have succeeded in designating, or establishing, coordination mechanisms or special authorities at a sectoral or global level. These arrangements refer to the management of water or of coastal and riparian biotopes, marine resources management, and others.

Countries with a more decentralised system have entrusted their local and regional authorities with the responsibility for planning and management of these areas.

In most countries, present tendencies move in two directions, not necessarily always incompatible : the formation of new coordinating mechanisms and/or more decentralisation.

#### c. Legislation<sup>(1)</sup>

Legislation has been substantially enriched since European Conservation Year 1970 in most, if not all, European countries. This process has also been helped by intensive activity in coastal and riparian issues at international level (Appendix 9). Most countries have included in their general legislation on planning or protection of the environment, special provisions for coastal areas, lake shores and river banks. Some have

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(1) For more details, see doc MEN 4 (84) 3 "The law applicable to coastal areas, river banks and lake shores ; review of the most original legal systems and of future prospects". Study presented by the Delegation of France.

issued specific acts concerning the protection of such areas (Ireland - Coastal Protection Act, 1963 ; Greece - marine environment legislation).

Usually legislative arrangements referring to coastal areas, lakes and rivers are spread in several texts, which often leads to gaps in both implementation and control processes. Other problems which have appeared in national reports are the difficulties in making agreements with land-owners, and the lack of financial and staff resources to ensure the implementation of nature conservation measures.

d. The delineation of a coastal or riparian zone

The area between the mean high and the mean low tides, often referred to as the wet sand area or foreshore, was designated as public property and protected in most countries long before the problems of coastal and riparian areas became an issue.

Beyond this area, landwards, many countries have a legally defined limited width of the back-shore or dry sand area, in order to serve, where necessary, public purposes. In this area, development has been restricted or prohibited (eg Norway, Sweden, Denmark). The foreshore and the limited width of the backshore is in most, if not all countries, free to public access. Although the principle of free access has been confirmed in all resolutions at international level, it still leaves many problems.

During the last decade, the intensive development of the areas adjacent to water obliged many countries to define an even larger zone in which special permits were required or restrictions applied. This zone often extends from 100 to 500 metres.

The delineation of an area in which special measures are applied has generally had positive results. Nonetheless, there are no general rules as to the exact width of the zone. Using various criteria (morphological, land use, ecological or economic), various widths have been specified. The basic parameters for the delineation of a boundary are set by the final intentions of coastal management and the particular institutional context in each country.

Sometimes a multi-boundary approach has to be applied to identify the coastal zone. This approach makes it possible to draw up regulations and policies adapted to the particularities of the areas involved, resulting in a more flexible system of management and control.

e. Land policy

An important component of an effective planning and management policy for coastal areas, river banks and lake shores is the availability and the development of proper tools and methods of control. Special attention should be focused on land, since most policies are land related. The social, legal and institutional structure of land ownership and land control determines the policy directions and sets the limits of the possibilities for intervention and for the implementation of a plan. A series of instruments for planning, taxation, market, financial support and administrative measures have been developed and implemented with varying degrees of success in member States (see Appendix 10),

f. Education

Despite the emphasis which has been placed on coastal and riparian issues during the past few years, the same attention has not been given in most countries to the introduction of the subject in primary and secondary education. Education on coastal areas, river banks and lake shores is usually part of the general environmental education programme.

Certain countries such as France, Sweden, Ireland, Portugal and the Netherlands have given particular attention to programmes referring to marine shores, rivers and lakes at all levels of their educational system. To a lesser extent, similar programmes have been developed in Switzerland, Austria, Spain and Greece. As to the situation in other countries such as the Federal Republic of Germany, Belgium and Denmark, which already have a well-developed environmental education system, no precise information has been supplied.

In most countries, the higher education system deals with the protection of coastal and riparian areas and lake shores. In recent years an increasing number of students has been directed to the above-mentioned fields. This has led to the establishment of new departments or the expansion of existing ones, leading to undergraduate and/or graduate degrees in such areas as oceanography, biology, ecology, limnology, coastal engineering, water management, ichthyology, etc.

g. Information

In most countries information is diffused through the written press, TV and radio broadcasts, pamphlets and specialised publications. Some countries have issued a series of interesting leaflets for the coastal and riparian ecosystems (sand dunes, rocky shores, etc.) Examples of such publications are those issued by the Nature Conservancy Council of the United Kingdom and those supported by the French "Conservatoire de l'espace littoral et des rivages lacustres".

An important role in arousing public awareness has increasingly been played by non-profit-making organisations. Examples of successful cases are :

- The 17 information centres for the environment (CPIE) in France which inform the public on matters of improving life quality standards and arouse public awareness ;
- The information and education centres set up by the Swiss League for the Protection of Nature (LSPN), which has 100,000 members, and WWF-Switzerland with 120,000 members. In the autumn of 1980 - under the title "Pro Natura Helvetica" - these two associations collected signatures and raised funds to save the south shore of Lake Neuchâtel. This effort raised in a short time the sum of about 4 million Swiss francs,

It seems that in general public participation and reaction to programmes of environmental protection has created greater awareness of the issues involved.



h. Research (1)

Research in fields related to the problems and features of the ecology of coasts, river banks and lake shores is carried out by universities, research institutes and other agencies, and appears to have increased, though not to an absolutely satisfactory degree, during the past decade.

Research programmes mainly refer to :

- monitoring of pollution of the aquatic environment
- monitoring of the impact of pollution on fauna and flora
- study of areas of ecological interest, such as wetlands
- protection of rare aquatic species
- assessment of the effects of different land management practices on the quantity and quality of water.

An analysis of the "Directory of Environmental Research Projects in the European Communities EUR 8079" has shown that of the 22,500 research projects included in the Directory, only 216 (0.96%) are directly or indirectly related to coastal issues. Nearly all the projects (91.7%) mentioned in the Directory are carried out in the Federal Republic of Germany and the United Kingdom. As regards distribution by topic, 66.2% are in the category "water", 6.9% in nature conservation and landscape protection (only 0.06% of the total projects included in the Directory) and 1.8% in environmental policy and planning. Of the countries included in the Directory, only the United Kingdom shows a "normal" distribution of coastal research by topic. 81.8% of the projects in the Federal Republic of Germany are in the category "water"(2).

Other sources show that there is considerable activity and interest regarding the Mediterranean. In a document on the "French contribution to the protection of the environment in the Mediterranean", by the French Ministry of the Environment (3), at least 16 research centres specialising in coastal matters are mentioned, most of them located in the French Mediterranean coastal regions.

The general conclusion which can be drawn is that, although research is not lacking, there is a marked deficiency in the exchange of information between research centres, exceptions notwithstanding. It is worthwhile mentioning the German-Dutch-Danish cooperation regarding the Wadden Sea, which includes coordination of research and the drafting of joint research reports.

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- (1) As a general rule, the information supplied in the national reports was not sufficiently detailed to give a satisfactory overall impression of the subject.
  - (2) The picture which emerges from this analysis reflects the amount of information sent by national contributors to the Directory.
  - (3) Ministère de l'Environnement et du Cadre de Vie. Contribution française à la protection de l'environnement en Méditerranée, mars 1981

i. Monitoring - data collection

Monitoring and data collection in various countries is carried out through the national monitoring networks, universities and research institutes.

Certain difficulties in disseminating data have been reported, mainly due to the variety of the agencies which collect the data and the lack of coordination between administrative departments.

The above problem has already been faced constructively with the development of coordinated administrative structures. In the United Kingdom, for example, dissemination of data is handled by coordinated agencies, such as the Biological Records Centre and the Marine Pollution Monitoring Management Group. France has established a central body, the Secretariat of Fauna and Flora. This agency is responsible for the development of a methodology for data collection in order to establish a monitoring network and create a data bank for fauna, flora and the natural environment. The Secretariat handles the data and arranges the exchange and dissemination of information to other organisations. Some other countries have also developed similar structures, or are in the process of doing so.

The present tendency in most countries is to consider advance knowledge of environmental conditions and natural resources not as something which will hinder development, but, on the contrary, as something which can help to find the most suitable (economically and ecologically) development possibilities, as well as areas which should be protected from human activities.

The projected "Information system on the state of the environment and natural resources" of the EEC and the Council of Europe's map of vegetation are both examples of attempts to provide the necessary background against which informed decisions can be made.

## B. POLICY GUIDE

### 1. BASIC PRINCIPLES

Fourteen years after European Conservation Year 1970, and twelve years after the Stockholm Conference, the threats to coastal and riparian environments are the same, while the prospects of confronting them are less promising. Despite the progress made and the momentum built up in the 1970's, the situation in environmental protection is now more difficult.

Today's environmental problems are even more complicated than they were when most environmental policies were launched. We have three different layers of effects which have to be tackled : those of the past period of rapid growth, those of the present period of economic crisis and those anticipated from future activities of economic recovery.

This serious disadvantage could and should be offset by a series of other developments which were brought to life during the same decade of crisis. These are :

- the acquisition of considerable knowledge of the state of the environment (ecosystems' mechanisms, effects of human action)
- the development and wide dissemination of the concept of the integrated approach to planning and management
- the realisation by all concerned of the necessity not simply to produce plans and formulate policies, but also to implement them.

All the above considerations refer to space as a whole, but they became even more pronounced in the sensitive field of coastal areas, river banks and lake shores. The special problems of these areas have been pointed out, not only in the preceding chapters of this report, but also in a series of documents produced by nearly all the international organisations concerned with environment and development during the last decade.

Present trends show that development will continue to be located near water. This tendency cannot always be avoided, often because there are just no alternatives. The solution to the problems of the water's edge is a challenge. If we can succeed there, the problems in other areas can then be more easily solved.

This Conference comes at the end of a series of activities at national and international level concerning coastal areas in particular (see also Appendix 12 and doc MEN 4 (84) 5). This legacy puts a heavy burden on the Conference and on the type of policies it should propose. In addition to adhering to all the principles defined in the World Conservation Strategy, it should especially emphasise the connection between environmental protection and economic development. This means that :

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Environmental resources should be seen as the basis of, as well as setting the limits to, economic development ;

Environmental policy should be an integral part of economic policy ;

Costs for environmental protection measures should be considered as inseparable from general development costs ;

The protection of the environment can contribute to economic recovery.

The achievement of these aims rests on a basic precondition. During the last decade we witnessed the development of general principles, policies, programmes. Now is the time to implement them. What we thus also need is the development of instruments of implementation fully integrated in the policy-making process.

In addition to the availability of sufficient financial means, the main requirements for effective implementation are : knowledge - both in the sense of acquisition as well as of dissemination of information ; coordination between sectors as well as between various levels of government ; public participation and management, including the effective implementation of legislation in respect of coastal and riparian areas.

Resolution n° 1 of the 6th session of the European Conference of Ministers responsible for Regional Planning (Torremolinos, Spain, 19-20 May 1983) sets out the general principles and objectives for the development and regional/spatial policy of maritime regions. In addition, however, in relation to the protection of the environment, development in coastal areas, on river banks and lake shores should have the following general objectives :

- a. The promotion of activities which could exploit the endogenous potential of the regions concerned without destroying the environment (eg agrotourism, aquaculture, etc). The experience of the post-war period has shown that, among other things, some large capital-intensive industrial projects, especially in less developed regions, and huge tourist facilities not integrated in the environment, do not produce the expected economic spin-offs.
- b. The integration of the environmental dimension in all economic activities (agriculture, industry, energy, transport, tourism, housing, technical works), and at the earliest possible stage.
- c. The promotion of environmental initiatives which might lead to the creation of new employment and contribute considerably to the solution of the environmental problems of coastal areas. Examples of such activities are :

the management of natural biotopes, the reclamation of derelict land, the protection or restoration of landscapes important from a cultural or historical point of view, the development and/or maintenance of alternative viable forms of agriculture adapted to sensitive areas ;

the development, production and installation of equipment to reduce pollution (eg sewage networks, water treatment plants) ;

the research and development of new techniques less polluting and consuming less natural resources and less energy, and the development of techniques of recycling ;

the creation of small or medium-sized firms of consultants on environmental matters ; the creation or development of structures for training/retraining workers for jobs in the environment field ; the development or creation of structures for arousing public interest and providing information.

European coasts, river banks and lake shores are characterised by the variety of their geological formations as well as the variety of their species and biocommunities. The preservation of this variety and uniqueness should be one of the first priorities at national and international level.

Coastal and riparian biotopes of special scientific interest and biologically critical, especially those considered to be internationally and nationally important, should be strictly protected. Other coastal and riparian areas should be developed according to the principles of ecological management. This means that the exploitation and the development of the areas under consideration must proceed only after the preparation of feasibility studies and management plans, so as to avoid irreversible effects on the environment and the depletion of natural resources.

The following are some of the principal means which may be used in any programme for the protection of coastal and riparian ecosystems :

the identification of important habitats and their strict protection, especially during critical seasons (ie breeding, migration, feeding) ;

the prohibition of all discharge of solid and liquid waste in these areas ;

the limitation of human intervention in these areas to wise management, judicious, traditional, non-structural activities such as nature observation, hunting, fishing ;

the carrying out of studies and works to protect and/or restore those areas, using soft technology methods (biological) ;

the increase of specialised staff at all levels for effective protection of these areas.

The objectives of the policy guide are :

to develop a basic European policy on the environmental planning and management of coastal areas, river banks and lake shores ;

to introduce the environmental dimension into the development of other sectors of human activities in these areas ;

to define specific measures to be taken for the conservation of each type of coastal and riparian ecosystem.

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## 2. PLANNING, ADMINISTRATION, LEGISLATION, EDUCATION, RESEARCH

### 2.1 PLANNING

#### a. Data collection

Priority should be given at national and international level to the establishment of inventories of coastal areas, river banks and lake shores of importance for the conservation of the European natural heritage by making use as far as possible of existing international systems.

#### b. Plans

In the concept of plans for the spatial development of coastal areas, river banks and lake shores, full consideration should be given to economic, social and environmental aspects.

Regions or parts thereof that appear on inventories of areas of importance for the conservation of the European natural heritage should be subject to special planning programmes aiming at their conservation and wise management.

#### c. Environmental impact assessment

The assessment of the impact of development should be an obligation of those who will develop or exploit a coastal or riparian area (principle of causality), under the supervision of the responsible governmental authorities, who will also take the final decision.

#### d. Land policy

An exchange of information on the effectiveness of instruments for the implementation of land policy (listed in Appendix 13) should be promoted.

#### e. Public participation

Public participation in the concept and preparation of plans should be ensured at the appropriate stages.

## 2.2 ADMINISTRATION

Coordination of the activities undertaken within one country by the various national authorities concerned with the management of coastal areas, river banks and lake shores should be ensured by the creation of appropriate structures and means of intervention.

Local and regional authorities should be given the opportunity to take part in decisions relating to the planning of areas under their authority and, where appropriate, under the supervision and coordination of the central national authorities.

At each level of national administration, environmental protection should be entrusted with the authority, and be given sufficient means (financial and staff) to be able to defend their interests against public or private claims for the exploitation of areas within their sphere of competence.

## 2.3 LEGISLATION

Considering the study by the Delegation of France (doc. MEN 4 (84) 3) the following should in particular be taken into account :

as far as possible, legislation on coastal areas, river banks and lake shores should be adapted to present situations, concentrated in one or few texts, easy to understand and suitable for direct implementation ;

legislation should provide for a framework which would, on the one hand, introduce a system of permits for the development of coastal areas, river banks and lake shores and, on the other, allow plans and programmes for coastal areas, river banks and lake shores to have the force of law ;

existing structures should be reinforced, or new structures be introduced, to ensure implementation and enforcement of existing legislation.

## 2.4 EDUCATION - TRAINING

Provision should be made in environmental education programmes for :

establishing in elementary and secondary schools educational courses directly related to the ecological importance of coasts, rivers and lakes ;

publishing specialised textbooks and/or pamphlets explaining the ecological aspects and value of coasts, rivers and lakes ;

involving in the preparation of education programmes all agencies which deal with the subject, and which often supply Ministries of Education with appropriate information ;

organising seminars and training courses for teachers ;

supplementing professional training with knowledge of environmental protection ;

training young people employed in environmentally related jobs (management of protected areas, park keepers, etc) ;

establishing postgraduate courses in environmentally related fields for unemployed scientists ;

creating a national institution or foundation for the financial and scientific support and coordination of environmental education.

## 2.5 DISSEMINATION OF INFORMATION

Dissemination of information on the importance of conserving coastal areas, river banks and lake shores, and on the ways and means of so doing, should be promoted by international and national organisations in cooperation with the national authorities concerned.

## 2.6 RESEARCH

Research should be directed, among other things, towards :

a better and more complete knowledge of the natural environment and its mechanisms

new ways and means of promoting sustainable exploitation of natural resources, including the creation of new employment ;

field research into the effects of human pressure in general and pollution in particular on special types of coastal and riparian biotopes ;

methods for the ecologically sound management of coastal and riparian protected areas.

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## 3. USE AND DEVELOPMENT POLICIES

### 3.1 AGRICULTURE

a. Appropriate land policy measures should be taken to ensure that prime agricultural land is used for agriculture, especially near urbanised areas, since its conservation could be of substantial benefit both to the economy of the area and to the natural and visual environment.

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- b. As far as possible, traditional agricultural methods should be used.
- c. Where agricultural land becomes no longer fit for that purpose, careful consideration needs to be given as to whether to leave it to nature or to reclaim it and thus reduce the pressure to develop marginal land elsewhere.
- d. Reclamation of important wetlands and riparian areas for agricultural use should be avoided.
- e. Agricultural wastes which cannot be used as fertilisers, should be used for energy production (eg biogas) or for other applications outside natural areas.
- f. The use of pesticides, herbicides and fertilisers in coastal and riparian areas should be limited to the absolute minimum.

### 3.2 AQUACULTURE AND FISHERIES

- a. An appropriate balance should be ensured between, on the one hand, the economic needs of fishermen and consumers' demand for fish and, on the other, the maintenance of the aquatic animal population and the benthos, with particular reference to nursery areas and areas suitable for aquaculture.
- b. Traditional aquaculture and mariculture activities should be promoted in wetlands and especially in lagoons and closed bays. Appropriate measures should be taken to reduce as much as possible any harm to biotopes and protected areas caused by the necessary infrastructure works (dredging, new channels, installations and collection facilities). Intensive aquaculture in sensitive natural areas should only be authorised in cases of overriding public interest and on the condition that it is preceded by an environmental impact assessment.
- c. Repopulation with endogenous species should be encouraged in accordance with article 11, paragraph 2 of the Bern Convention.

### 3.3 INDUSTRIAL DEVELOPMENT

- a. Where appropriate, industries should be encouraged to settle inland, away from coasts, river banks and lake shores.
- b. Location in coastal and riparian areas should only be authorised for industrial activities or installations exploiting local mineral resources or industries which are coast or water dependent, or in other cases of overriding public interest.
- c. When a coastal or riparian site is essential for particular industries, these should be steered towards areas with little environmental interest, or to areas where the harmful effects on the wider coastal and riparian space are at a minimum, in particular to run-down, derelict areas suitable for redevelopment and to areas of high unemployment.

- d. Industries located in coastal and riparian areas should use, and promote whenever possible, the endogenous potential of the regions.
- e. The location of polluting or otherwise harmful industries in or near protected areas should be prevented.
- f. Relevant conventions and protocols of international organisations, bilateral agreements and EEC directives and decisions (see Appendix 12) on the control and abatement of pollution caused by various types of industries should be implemented.

### 3.4 TOURISM AND RECREATION

- a. Tourist development should be strictly controlled in or adjacent to biotopes and protected areas of national and international importance.
- b. In areas of environmental interest which are not fully protected, only camping and other non-permanent tourist installations should be allowed.
- c. Wherever there is a need for tourist development, careful consideration should be given to what will be the least damaging to the environment. The conversion of existing buildings to tourist installations, especially in traditional settlements, as well as the renting of rooms in houses, should be encouraged. Scattering of new tourist development should in general be avoided. The construction of concentrated complexes (the honeypot theory) might also serve to attract tourists away from sensitive areas.
- d. Pressure for the development of recreation sites in coastal and riparian areas near urban centres should be channelled to sites which have less environmental importance or which have already been adapted for these purposes.
- e. Appropriate measures should be taken to maintain and/or improve the quality of bathing waters by controlling sewage disposal.
- f. The development of tourist activities should not be detrimental to the natural flora and fauna and their habitats. Regulations should provide for temporary prohibition of free access to strictly protected areas.
- g. The extension and/or staggering of holiday periods, though often beneficial to the economy and the environment, should be avoided when this would seriously disturb endangered plant and animal species in or near natural areas.

### 3.5 HOUSING AND URBAN DEVELOPMENT

- a. Housing and urban development outside coastal urban areas should be limited to an area at a minimum acceptable distance from coasts, river banks and lake shores. Linear development along the coast should be avoided wherever possible.

b. Measures should be taken to ensure that sewage from coastal and riparian cities and towns should be purified so as to cause the least possible damage to terrestrial and aquatic ecosystems. Especially for bathing areas, aquacultural areas and sensitive natural areas, treatment plants should discharge their effluents at a sufficient depth and distance from the coast or shoreline.

c. Permits for construction works and land management activities should include the obligation to avoid soil erosion and to restore the natural environment as far as possible afterwards.

### 3.6 ENERGY FACILITIES

a. For coast dependent energy facilities, alternative siting in areas which have no overriding environmental interest should be considered. For non coast dependent energy facilities, siting should be considered in areas outside the coastal and riparian zones. In all cases, the environmental impact on the sites should be assessed.

b. In the case of energy needs, the use of renewable forms of energy should be considered but care should be taken to ensure that the impact of the construction of large-scale wind and wave installations on the environment is carefully assessed before proceeding.

c. The impacts associated with the production of hazardous wastes should be carefully assessed. Alternative cooling systems other than "once through cooling" should be considered.

d. Oil refineries and petrochemical facilities should be located at the maximum distance from sensitive areas and be subject to strict regulations.

e. Electric generating stations should be located after a comparative evaluation of alternative sites, of technologies of production and transport and of the productive use of plant residues.

f. Specially strict measures should be taken to ensure that due consideration is given to environmental requirements when terminals and associated facilities for receiving, storing and distributing natural gas or coal are located in coastal and riparian zones.

g. Corridors for crude oil and natural gas pipelines should be as narrow as possible and, as far as is practical and in accordance with safety regulations, should be located in or adjacent to existing, already-developed, roads, railways and pipelines. Where environmentally sensitive or protected terrestrial or aquatic areas cannot be avoided, priority should be given to careful restoration of the area.

### 3.7 MINING

a. Special authorisation should be required for mining operations, so as to minimise the adverse impact of noise, dust, water pollution, waste materials and visual disturbance.

b. Mineral extraction areas should be restored wherever possible, or reclaimed to an appropriate and beneficial land use.

- c. Provision should be made to mitigate the environmental impact of soil erosion during mining.
- d. Measures should be taken to avoid and abate pollution in cases of oil-rig accidents.
- e. Sand extraction and under-water mining should be regulated.

### 3.8 TRANSPORT FACILITIES

- a. New road and railway constructions should not in general be sited near the coast or shoreline if suitable alternatives exist. Neither roads nor parking facilities should be allowed in sensitive coastal and riparian ecosystems. Adequate parking facilities, bicycle and footpaths should be provided in or near areas selected for visitors and users, according to ecological criteria.
- b. The harmful effect on the environment of the growth of large ports should be controlled as far as possible. The development of medium sized ports, and of fishing ports, should be allowed, provided that a sufficient distance is kept from sensitive biotopes and protected areas.
- c. During the construction of port facilities, jetties, etc., care should be taken to avoid any significant effect on the inshore currents and the sedimentation regime of the coastal waters.
- d. Airports should be sited as far as possible from protected areas.

### 3.9 TECHNICAL WORKS

- a. Dredging in protected areas should be prohibited, unless it is necessary for conservation purposes, and should be controlled in other natural areas so as to minimise damage to the ecosystems and to the judicious exploitation of the marine and riparian resources.
- b. Waterbed engineering should only be undertaken for reasons of overriding public interest while filling could also be undertaken for necessary land protection. In any case, care should be taken to minimise adverse effects on water quality, marine productivity, public health and especially on the status of protected areas.
- c. During the design and construction of inland roads, bridges, dams and works for the diversion or impoundment of water, the necessary measures should be taken to avoid disturbance of the natural sedimentation process.
- d. Steep banks and shores resulting from technical works and likely to produce erosion or landslips should be smoothed down or terraced.

### 3.10 SHIPPING AND BOATING

- a. International conventions on dumping from ships and accidental spills (the London, Helsinki and Barcelona Conventions) should be strictly implemented.
- b. In planning shipping lanes, marine protected areas should be avoided as far as possible.

c. Motor-boats should be banned from protected areas and regulated in other areas of importance for public health, nature conservation and recreation. Special attention should be given to avoiding pollution, excess traffic and disturbance of protected areas in inland waterways. Windsurfing should be regulated in protected areas and banned in sensitive biotopes.

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#### 4. ECOSYSTEMS' AND SPECIES' POLICIES

##### 4.1 TERRESTRIAL COASTAL ECOSYSTEMS

###### a. Ammophilous ecosystems (sandy beaches, dunes, silt and mud foreshore)

Vegetation should be kept intact to prevent disturbances of sandy beaches and dunes.

Natural beach processes should be maintained by discouraging structures which adversely affect littoral sand transport, unless such processes create conditions which may become hazardous to the stability of the area and to public safety.

Shore protection programmes which aim at preserving the natural beach profile should be encouraged and developed.

Seriously eroded beaches should be restored where appropriate.

Topographic relief should be restored after sand extraction, by replanting or reseedling, so as to limit wind and marine erosion.

Private and public projects to restore and stabilise dunes, especially with fences and indigenous plants, should be encouraged.

Disturbance of sensitive dune areas by vehicles should be prevented.

Construction of motorways adjacent to sandy beaches and dunes should be avoided.

Beach expansion by filling, dumping, etc. especially in the more sensitive areas, should be avoided.

Construction of all types of buildings should be prohibited within a minimum distance from the beach.

The large-scale and commercially organised repair of boats and small vessels should as far as possible be prohibited on sandy beaches and dunes, and should be restricted to suitable sites.

Excavation and removal of dunes and beach ridges in sensitive areas should be prohibited.

Sand extraction should be limited, as far as possible, to specially selected areas where the harmful effects are at a minimum.

b. Rocky and steep shores

The use of natural means and properly designed structures for protection against erosion should be encouraged.

Human activities that would alter the natural evolution of the shore profile, ie extraction of rock material for industrial or tourist installations, should, wherever possible, be restrained or prohibited in areas of importance.

Construction of roadways on rocky shores should be avoided, but when necessary, the most suitable distance from the coastline should be determined.

Housing and tourist development should be limited on very steep, rocky shores.

The development of settlements in sensitive areas should be limited, and should be allowed only on condition that their construction does not excessively harm the natural flora and fauna, and that they are compatible with the environment.

The construction of port facilities - for boats and small vessels - and the necessary works should be controlled and should always be compatible with the natural environment.

c. Coastal heathlands, bushes and degraded plant formations

To control erosion and surface runoff, sound conservation practice should be required, eg the provision of buffer strips of natural vegetation along the coastline.

The development of summer settlements should be allowed on condition that the natural vegetation is conserved to the maximum.

Large surfaces should be stabilised immediately after any operation that destroys the natural vegetation and leaves the soil open to erosion.

d. Forests

Coastal forests should be strictly protected, especially those on alluvial soils.

Logging activities should be controlled, so that watershed runoff is maintained at its original quality and flow levels.

Erosion control standards should be established and applied in all phases of coastal logging operations, so that watershed runoff is maintained at its original quality and flow levels.

Measures should be taken to reduce the danger and the damage of forest fires.

#### 4.2 COASTAL MARINE ECOSYSTEMS

The discharge of effluents and the dumping of sludge into the sea should be subject to the provisions of the relevant international instruments such as the London Dumping Convention, the Barcelona Convention, the Helsinki Convention, etc.

All regulations, practices, standards, etc. suggested by international agencies, such as the Intergovernmental Maritime Organisation, should be adopted and complied with.

Fish spawning grounds and various benthic communities should be protected against any activities that would change the natural processes of these systems.

In restricted areas such as fjords, closed bays and lagoons, the dumping of dredging materials and even the discharge of biologically treated waste waters should be avoided as far as possible.

In open coastline with favourable conditions, eg open exposed coasts, good oxygen supply, clear transparent water, the discharge of waste waters with suspended matter should not be allowed unless a suitable submarine outfall is used.

States should examine the possibilities of utilising domestic and/or industrial effluents rich in essential nutrients - without suspended matter - in alleviating production in oligotrophic waters (eg Mediterranean Sea) even in restricted areas such as small bays.

Discharge of waste waters with suspended matter or any other activity which would increase the turbidity should be avoided entirely in areas with underwater meadows, known nursery and fishing grounds, etc. even if a submarine outfall is used.

Fishing activities liable to destroy benthic systems should be regulated, especially in areas of known nursery and fishing potential.

#### 4.3 ISLAND COASTAL ECOSYSTEMS

Endemic animals and plants should be protected and the introduction of exotic species should be prohibited, especially in small islands.

Totally or partly denuded islands should be replanted with indigenous species.

Traditional crops and activities such as apiculture and the judicious exploitation of aromatic plants on Mediterranean islands should be encouraged.

The judicious management of forests should also be encouraged ; single species forests of eucalyptus or exotic pines should be avoided.

The carrying capacity of these systems should not be exceeded by tourist activities, housing and the exploitation of mineral resources.

#### 4.4 RIVER BANKS AND LAKE SHORES

Resolution (77) 8 on the protection of lake shores and river banks and Recommendation R (82) 12 on alluvial forests in Europe should be implemented.

Measures should be taken to ensure the protection of the edge-zone on river banks and lake shores, especially where alluvial forests are concerned.

Each development project should be preceded by a study on the impact on the river bank and lake shore ecosystems.

Interventions on river banks which are still in a natural state should be prohibited, unless they are of overriding public interest.

The measures taken to avoid flooding of rivers should be those which have the least impact on the environment, such as the planting of suitable plants and trees.

The degradation of river bank ecosystems by the discharge of effluents or the dumping of wastes should be prevented.

Measures should be taken (eg drainage, planting) to avoid the washing out and transport to the rivers of soil material from forests and agricultural and other areas.

The impact on riverside ecosystems of the operation of hydroelectric power stations, mines, etc. should be under strict, systematic surveillance.

#### 4.5 WETLANDS

States should adhere to the Ramsar Convention and implement its provisions.

In general, reclamation of wetlands should be prohibited. In cases of overriding public interest, an environmental impact assessment should be carried out.

Management plans should be drawn up and implemented so as to promote, wherever possible, the conservation of wetlands and, in all other cases, their wise use.

In particular, plans which aim at promoting research, enhancing the recreational and aesthetic values, and protecting the unique and exceptional sites should be prepared.

Activities which exploit the resources of the area without altering the environment, such as aquaculture, mariculture, etc., should be allowed.

Where possible, degraded wetlands should be restored.



Activities that alter the surface of wetlands in certain regions, such as excavation, filling, clearing, paving and grading, should be restrained.

Activities that alter the natural water systems of wetlands, such as draining and dyking, should be limited to the strictly necessary.

The degradation of wetlands caused by the discharge of pollutants or the dumping of wastes should be prohibited.

The construction of permanent or semi-permanent recreational installations should be prohibited.

#### 4.6 ARTIFICIAL LAKES AND CANALS

Where appropriate, measures advocated for the protection of river banks, lake shores and wetlands should be applied to artificial lakes and canals.

#### 4.7 PROTECTED BIOTOPES - SPECIES

States should adhere to the relevant international agreements on the protection of fauna and flora and their biotopes (such as the Washington, Ramsar, Bern and Bonn Conventions), implement their provisions and participate in international programmes such as the MAB system and the Council of Europe's biogenetic reserves network.

In particular, States should :

if necessary, adapt and reinforce their existing legislation ;

implement the provisions of Article 11 (2) of the Bern Convention regarding the introduction of exotic species, especially in areas where endemic taxa are found ;

protect the biotopes of important species by setting up protected areas on the basis of adequate legal provisions and, when appropriate, designating the area under the relevant international instruments ;

ensure full conservation of the established protected biotopes ;

undertake studies and research on the distribution, the biology, the ecology and the conservation status of plants and animals in coastal areas and on river banks and lake shores ;

ensure strict protection of threatened species and their habitats ;

publish Red Data Books if they do not yet exist ;

coordinate the establishment of seed banks for endangered plants and of coastal and riparian botanical gardens.

The appendices I - XI are based on information provided by the member States up to September 1983. Any figures given should not be used for comparison between States since no common criteria have been used.

## A P P E N D I X 1

### COASTAL AREAS

- a. (i) Total length (km)
- (ii) Area of coastal zones (ha)
- (iii) Area of intertidal zones (ha)
- b. Distribution of coasts
  - (i) Temperate seas (Mediterranean-Atlantic)
  - (ii) Cold seas (Atlantic, North Sea, Baltic)
- c. Length or percentage of total length of flat (sedimentary) and steep (erosive) coasts
- d. Percentage of coastal length where regulating works exist
- e. Classification of coasts, natural, semi-natural, artificial
- f. Area (ha) or length (km) or percentage of coastal areas occupied by sand dunes
- g. Particular coastal types (fjords, rias, polders, etc)
- k. Types of ecosystems
- l. Evolution of ecosystems
- m. Present uses (including protection)
- n. Natural disasters
- p. Threats
- q. Desirable (possible) uses of ecosystems for the conservation of the ecological balance

BELGIUM

- a. (i) 67 km, (ii) 31,400 ha, (iii) 6,000 ha
- b. (ii) Cold seas : North Sea
- c. Most of the coast is sandy, with or without dunes
- d. 5% (Port of Zeebrugge installation)
- f. Approximately 1,500 ha
- e. Natural 10%, artificial 90%
- g. There are some polders behind the dunes
- k. Terrestrial ecosystems : most are ammophilous (sandy beaches and dunes)  
Aquatic ecosystems : soft substrate (without beds of phanerogams)
- l. The urbanisation of the coastal zone caused complete destruction of a considerable part of the sand dunes. The remaining dunes are protected and if possible restored. There is a tendency to displacement of sandy beaches towards the eastern part of the coast and probably a progressive eutrophication of the aquatic ecosystem
- m. Ammophilous ecosystems : recreation (access to certain dunes is prohibited)  
Aquatic ecosystems : sand banks, in the subtidal zone, are used for sand and gravel extraction
- n. There are no natural disasters typical of the area
- p. Terrestrial ecosystems : tourism (roads, camping, settlements, etc), construction of marinas, etc  
Aquatic ecosystems : eutrophication, microbial and industrial pollution, sub-sea excavations, sand and gravel extraction
- q. - "Sanctuarisation" of certain terrestrial and aquatic zones, permanently or temporarily (eg during the reproduction period of fish)  
- Active measures regarding physical planning (absolute respect of the Section Plans and implementation of them in cooperation with the movements for the protection of nature)  
- Careful implementation of the obligations resulting from the Conventions of Oslo and Paris (regulations on dumping, standards of emission, control and impact studies) with regard to the pollution of the marine environment  
- Careful implementation of the various directives of EEC.

CYPRUS

- a. (i) 782 km
- b. (i) Temperate Seas : 100% Mediterranean
- f. About 1,200 ha. Almost the whole area of the sand dunes was stabilised in the past by the Forest Department
- k. Terrestrial ecosystems : 585 ha coastal forests (101 ha of this area (or 17%) are littoral forests on sandy alluvial soils)

- m. Ammophilous ecosystems : Tourism and sand extraction
- p. Ammophilous ecosystems : Tourism, sand extraction and oil pollution
- Coastal forests : Touristic development near the sea-shore, removal of sand and gravel from the sea-shore for building purposes and forest fires

# DENMARK

- a. (i) Approximately 7,400 km of which about 1,500 km consist of the continental type while the rest, approximately 5,900, are of insular type
- (iii) Approximately 84,000 ha of which 59,000 ha are tidal flats and 22,000 ha salt marshes
- b. (ii) Cold seas : 6,900 km Baltic, 500 km North Sea
- c. - Flat coast : 3%
- Steep (erosive) coast : 6% (of which approximately 17% consist of rocky basement coasts and 83% cliffs)
- Shores (either stable or sedimentary) : 91%
- d. The main regulating works exist on the North Sea coast
- e. - Natural (most of the coast)
- Artificial (a few per cent)
- f. At least 1%, but more likely 5% (21,500 ha and 86,000 ha respectively) ; most of the dunes are in west Jutland
- g. - Polders (less than 1% of total coast length) exist in the tidal coast region
- Fjord coast of east Jutland
- k. Terrestrial ecosystems : amrophilous is dominant, if sandy and gravel beaches are included, halophilous, coastal heathlands and coastal forests
- Aquatic ecosystems : soft substrate ecosystems are dominant rocky substrate ecosystems make up only 30 km of the total
- m. - Fishing
- Recreation (hunting, summer residences/week-end cottages, bathing, yachting and so on)
- Waste water and sewage outlets
- Rock quarrying
- Sand and gravel exploitation
- Military purposes
- n. Floods : floods of over 2m above DNN (Danish Ordnanse Datum) occur almost every year. Flooding exceeding 4 m occurs only once in about every 100 years. The dykes are constructed to resist floods having a mean frequency of one/two hundred years
- p. - Waste water outlets from households
- Waste water outlets from industry
- Oil pollution
- Tourism (erosion, pollution, litter, etc)
- Exploitation of stone, sand and gravel
- Drainage
- Pollution from spreading fertiliser in the surrounding area

## FRANCE

- a. (i) 4,720 km (including the islands) measured on a map 1 : 100,000  
Approximately 800 km of estuaries are included in the total length.
- (ii) Between 150,000 - 250,000 ha
- b. (i) Temperate seas : 1,800 km Atlantic, 1,720 Mediterranean  
Cold seas : 1,220 km
- c. Flat (sedimentary) 59%, steep (erosive) 41%
- f. Approximately 500 km
- k. Terrestrial ecosystems : ammophilous 30%, halophilous on rocky shores 40%, coastal heathlands and bushes 20%, coastal forests 10%  
Aquatic ecosystems : rocky substrate 40%, soft substrate 60%
- m. Maritime, submarine cables and pipes, transport, national defence, industries and services. Resource (fishing, aquaculture, exploitation of algae, etc). Source of raw materials (construction materials, hydrocarbons, salt, etc). Source of energy, recreation and health. Dumping (industrial and urban wastes, explosives, radioactive materials, etc). Offshore constructions.
- p. Ecosystems on soft substrate : sand and gravel extraction  
Sand dunes and beaches : urbanisation, recreation, installations, artificial ports, construction of dykes  
Forests : urbanisation, fires
- q. The maintenance and improvement of traditional agriculture and fishery, limitation of forest fires and development of aquaculture, taking into account as much as possible the maintenance of the ecological balance

## FEDERAL REPUBLIC OF GERMANY

- a. (i) 820 km
- b. (ii) Cold seas : 330 km Baltic, 490 km North Sea
- c. Flat coast : the North Sea coast (which is characterised by the influence of the tide and referred to as "watt" (tidal flats)). The most important ecological zones on the North Sea coast are the salt marshes and the tidal flats. These latter are of paramount importance, since this ecosystem with its highly specialised indigenous animal and plant species is unique in the world  
Steep coast: The Baltic coast is characterised by sand and rock cliffs, storm beaches, beach "spurs", sand spits, dunes and lagoons. Most important differences from the North Sea coast :  
- tides are hardly noticeable  
- much lower salinity of the water  
- absence of mud flats as a result of low tidal range
- p. Wadden Sea : construction of dykes, marine pollution caused by tourism and recreational boating, disturbance to bird population by hunting  
Baltic Sea : extremely heavy marine pollution caused by sewage discharged from neighbouring States on the Baltic, strong increase in recreational use

- q. Wadden Sea : to stop the construction of new industrial plants to declare the Wadden Sea a national park and, where appropriate, a wetland of international importance ; to establish more nature reserves
- Baltic coast : to construct more sewage purification plants and more recreational facilities in agreement with nature conservation authorities to establish more nature reserves and to declare the shallow-water zones a wetland of international importance

#### GREECE

- a. (i) Approximately 15,000 km (of which the mainland coast comprises 7,300 km and the insular 7,700 km)
- b. (i) Temperate seas : 100% Mediterranean
- c. Flat (sedimentary) 30% ; steep (erosive) 70%
- f. Approximately 100 km (3,000 ha)
- k. Terrestrial ecosystems : ammophilous 20%, halophilous on rocky shores 40%, heathlands - bushes 30%, forests 10%
- Aquatic ecosystems : rocky substrate 55%, soft substrate 45%
- m. Recreation, agriculture, fishing, forestry, tourism
- p. Uncontrolled tourism, illegal housing, fires, over-grazing, agricultural reclamation, illegal fishing

#### IRELAND

- a. (i) 5,596 km
- (ii) 456,000 ha (55% of the total land area)
- b. (ii) Cold seas : Atlantic 100%
- c. Flat (sedimentary) coasts : estimated at 2,500 km
- Steep (erosive) coasts : estimated at 3,096 km
- d. Approximately 3%
- e. Natural 94%, semi-natural 4%, artificial 2%
- f. 14,300 ha
- g. Fjords approximately 2%, estuaries/lagoons/bays approx. 15%, rias (at least 5) approximately 10%, polders approximately 1%
- k. Terrestrial ecosystems : ammophilous (14,300 ha of sand dune systems ; 547 km sandy beaches)
- halophilous (very little salt marsh) about 2%
- coastal heathlands-bushes (very little)
- coastal forests (4,166 ha state forests in defined coastal zone in 1969)
- Aquatic ecosystems : rocky substrate : about 30%
- soft substrate : approximately 70% - extensive areas of sand and gravel
- intertidal mud flats

- l. Sand dunes : excessive grazing by cattle  
removal of  $\text{CaCO}_3$  material as fertiliser  
excessive recreation in a few localised areas  
removal of sand and gravel for building
- Forests : accidental fires
- m. Sand dunes : grazing, sand extraction, recreation  
Salt marsh : agricultural, wildlife, dumping refuse  
Forests : forestry, recreation  
Estuarine : salmon netting, harvesting and cultivation of molluscs, especially oysters, mussels, winkles
- n. Landslips have been recorded in Co.Wexford after coastal erosion. No known significant impact on ecosystems.
- p. Recreation, reclamation, increasing urbanisation, industrial and organic pollution, over or intensive grazing by herbivores
- q. In most cases, normal controlled traditional grazing and harvesting would be acceptable

### ITALY

- a. (i) Approximately 7,500 km (mainland 4,100 km, islands 3,400 km)
- c. Flat (sedimentary) : the Adriatic coast, formed by alluvial and marine deposits ; the Ionic coast (often swampy, low sandy beaches alternating with short, rocky stretches and low spurs) ; the southern part of the Tyrrhenian coast (with alluvial deposits from rivers mixed with marine sand), parts of Calabria and insular coasts
- Steep (erosive) : parts of the Adriatic coast ; Mount Conero promontory (approx. 20 km) ; southernmost part (approx. 70 km) ; North Tyrrhenian coast (bordered by narrow, sandy beaches) ; parts of the Calabrian and insular coasts
- p. Urbanisation, land reclamation, industries altering the original situation, the building of infrastructures (harbours, jetties, etc) pollution, destruction of the protective dune-maquis system, fires, uncontrolled touristic exploitation.

### MALTA

- a. (i) 190 km
- (ii) Approximately 2,000 ha
- b. (i) Temperate seas : 100% Mediterranean
- c. Steep (erosive) : 100% (20% cliffs, 80% rocky coasts)
- e. 64% natural, 18% semi-natural, 18% artificial
- f. 5%
- k. Terrestrial ecosystems : ammophilous ecosystems 1%  
halophilous ecosystems 60%
- Aquatic ecosystems rocky substrate 85%, soft substrate 15%  
(mainly Posidonia submarine beds)
- m. Sandy beaches : recreation  
Flat rocky beaches : recreation
- p. Terrestrial ecosystems : coastal development in some areas  
Aquatic ecosystems : over-fishing
- q. Over exploitation under legislative control

# THE NETHERLANDS

- a. (i) 456 km
- (ii) Approximately 306,000 ha, comprising the following :
  - dunes 36,000 ha
  - sandy beaches about 8,000 (intertidal approx. 3,000 ha)
  - salt marshes " 8,000
  - mud flats " 200,000 (Wadden Sea, Delta area)
  - estuaries " 42,000
  - salt lakes " 12,000
- (iii) Approximately 210,000 ha (including the Wadden Sea)
- b. (ii) Cold seas : North Sea 100%
- c. Flat (sedimentary) 456 km (100%), of which approximately 30% continuous, 50% Wadden Sea, 10% estuaries
- d. 100%
- e. Natural nil, semi-natural 178 km dunes, artificial 274 km dykes
- f. 39%
- g. Dunes 39%, polders 45%, enclosure dykes 11%, Westerschelde-outflow area 1%, others 4%
- k. Terrestrial ecosystems : ammophilous ecosystems 60%,  
halophilous ecosystems (artificial) approximately 5%  
Aquatic ecosystems : rocky substrate (artificial) approx. 5% (eastern Schelde, Delta, Wadden Sea),  
soft substrate (submarine sea-grass vegetation in Lake Grevelingen of 4,000 ha is apparently the largest continuous area in north-west Europe)
- l. Storm surges can have a significant effect on the Dutch coastal system as was proved with the major flood in 1953. The present coastal defences are designed to withstand all storm surges, with a statistical tolerance of over-flow over the dykes of once in 10,000 years.
- m. Terrestrial ecosystems : coastal defence, water infiltration and extraction for drinking water, recreation, military use  
Aquatic ecosystems : fisheries, marine culture, recreation, sand extraction, dredging and dumping
- p. Pollution, eutrophication

# NORWAY

- a. (i) Approximately 54,800 km, including mainland and islands :  
mainland (including fjords and bays) 21,190 km  
islands (about 57,000 in number) 33,600 km
- (ii) 33,597 x 10<sup>2</sup> ha (only for islands)
- c. No quantitative data available
- g. Fjords : western Norway, between Stavanger and the Trondheim fjord, represents the typical fjord coast region. Many of the fjords cut through the north-south mountain range, far into the country. Songerfjord is the longest and deepest (1300 m deep). The thresholds of the fjords may impede the natural circulation of the inner water masses, creating special biological conditions in the fjords.



- m. Coastal areas of high conservation interest are found not only in mainland Norway, with islands, but also in the archipelago of Svalbard (area 62,000 km<sup>2</sup>), where a large part of the coastline is covered by glaciers. In this part of the country, about 50% of the land area is protected by national parks and nature reserves.
- p. Urbanisation, certain recreational activities, marine installations, sand and gravel extraction from beaches and sea bottom, oil pollution and pollution from land-based activities.

# PORTUGAL

- a. (i) 1,943 km, of which 942 km are mainland and 1,001 km insular. (267 km and 734 km in the autonomous regions of Madeira and the Azores respectively)
- (iii) Mainland coast : approximately 2,500 ha  
Madeira : 50 ha
- b. (i) Temperate seas : Atlantic 1,943 km (100%)
- c. Flat (sedimentary) coast : mainland 458 km  
Madeira nil  
Azores 5%  
Steep (erosive) coast : mainland 484 km  
Madeira 256 km  
Azores 95%
- d. Mainland coast : 0.08%  
Madeira : 0.04%  
Azores : 4.2 %
- e. Mainland coast : natural 28.75%, semi-natural 42.2%, artificial 29.05%  
Madeira : natural 68.7%, semi-natural 56%, artificial 7.3%  
Azores : natural 39.8%, semi-natural 37.5%, artificial 22.7%
- f. Mainland : 1,013 km  
Madeira : 16%  
Azores : 0.2%
- k. Terrestrial ecosystems : mainland - 23% coastal forests and 1.17% littoral forests on alluvial soil  
Madeira - 4.1% ammophilous, 20.4% halophilous, 65% coastal heathlands and bushes, 8% coastal forest  
Azores - no quantitative data available  
Aquatic ecosystems : no quantitative data available
- l. Mainland : dunes and flat coasts evolution is affected by their orientation in relation to the predominant winds (north-west and north) and marine movements. Another important element is sedimentation due to solid material carried by watercourses. Coastal forests have been developed to fix the dunes.
- m. Sand extraction, agriculture, recreation, housing (urbanisation), tourism
- p. Extraction of inert material, ineffective drainage of rainfall, tourism

## SPAIN

- a. (i) 7,872 km (estimated on a scale of 1 : 500)
- b. (i) Temperate seas : Mediterranean (mainland 1,854 km  
islands 1,349 km)  
Atlantic (mainland 1,915 km  
islands 1,541 km)  
Cantabric 1,221 km
- c. Sandy coast : 38% (51.48% of the Mediterranean part,  
50.62% of the Atlantic part and  
65.64% of the Cantabric part)  
Marshes 4.03% (40.9% of the Mediterranean part,  
38.97% of the Atlantic part and  
21.5% of the Cantabric part)  
Rocky coasts 51.03% (2.55% of the Mediterranean part and  
5.2% of the Atlantic part)  
Artificial coasts 5.21% (4.71% of the Mediterranean part,  
6.39% of the Atlantic part and  
12.8% of the Cantabric part)
- m. Recreation-tourism 23.56%, fishing ports 8.81%,  
industrial 3.17%, nature conservation 6.09% indeterminate 59.04%
- p. Urbanisation, industry, tourism, contamination, fires,  
droughts, extraction of inert materials, profit on hunting,  
river dams (inhibition of deposit material transport)

## SWEDEN

- a. (i) Approximately 15,000 km (measured on a scale of 1 : 10,000),  
including the island of Gotland and islands with bridge  
communications. The mainland coast is about 14,000 km and the  
islands (Gotland and Öland) are about 1,300 km
- (ii) Approximately 500,000 ha
- b. (ii) Cold seas : North Sea (2,000 km length, 75,000 ha area)  
Baltic (13,000 km length, 425,000 ha area)
- c. Predominantly sedimentary coasts :
  - sandy coasts with or without dunes 5%
  - estuaries, deltas, river mouths, graus <1%
  - moraine coasts (stone, boulder) about 50%
 Predominantly erosive coasts :
  - rocky coasts, practically stable over a  
period of some human generations about 40%
  - cliff coasts, erodible over a period  
of a human generation <1%
  - rocky coasts with narrow sandy beaches <1%
- f. About 2,000 ha or about 1% of the total coast length
- g. The Gullmarn fjord (or semi-fjord) on the west coast,  
the "rauk" coast (stack coast) on the island of Gotland and  
the "high coast" in the county of Ångermanland.
- k. Terrestrial ecosystems : ammophilous ~ 5%  
halophilous ~ 35%  
coastal heathland-bushes ~ 35%  
coastal forests ~ 30%  
(alluvial forests negligible)
- Aquatic ecosystems : rocky substrate < 5%  
soft substrate ~ 95%

- m. Recreation, fishing, sand extraction (marginally), protection of the natural environment
- n. No natural disasters have occurred which have had a significant effect on the Swedish coastal ecosystems. Landslips locally have caused limited morphological changes. They are infrequent.
- p. Discharges from industries (pulp factories, steel works, refineries and power stations) as well as from municipal sewage treatment plants. Excessive fertilisation. Harbour developments. Sand and gravel extraction. Oil pollution

**TURKEY**

- a. (i) 8,333 km
- (ii) 303,955 ha
- b. (i) Temperate seas : Mediterranean (4,382 km length, 181,945 ha area)  
Marmara (925 km length, 9,300 ha area)  
Black Sea (1,695 km length, 99,450 ha area)
- c. 75% flat (sedimentary), 25% steep (erosive)
- e. 85% natural, 10% semi-natural, 5% artificial
- f. 110,300 ha
- k. Terrestrial ecosystems : 23% littoral forests on sandy  
alluvial soils  
Aquatic ecosystems : rocky substrate 25%  
soft substrate 75%
- m. Ammophilous ecosystems : recreation, sand extraction  
Aquatic ecosystems : recreation, fishing
- n. Earthquakes and landslips, but with no major effect on  
coastal ecosystems
- p. Fires (for coastal forests)

UNITED KINGDOM (GREAT BRITAIN ONLY)

- a. The following data are based on a coastal study published in 1968
- (i) England and Wales : 4,412 km, of which 1,230 km lies in Wales  
This measurement includes coastline with a direct frontage to the sea and inlets only where they could properly be regarded as "arms of the sea", for example below the lowest ferry point or natural ferry point if no actual ferry exists. In general, offshore islands, other than small rock stacks, were included.  
Scotland : 10,190.6 km (measured on 1 inch scale). The mainland comprises 3,906 km and the islands 6,282 km
- b. (i) Temperate seas : Atlantic 50%
- (ii) Cold seas : Atlantic 10%, North Sea 40%
- c. Flat coasts : 50% (comprising beaches, intertidal flats and salt marshes  
Steep coasts : 50% (including cliff coasts of all kinds, rocky shores and beaches protected by sea walls)



## A P P E N D I X 2

### RIVERS - RIVER BANKS

- a. (i) Number, length (km), mean annual flow ( $m^3$ /year)
- (ii) Percentage of mountainous and plain zones
- b. (i) Number of rivers with hydraulic works, % length of riparian banks
- (ii) Percentage of length of riparian zones affected by regulating works
- c. Types of ecosystems
- d. Evolution of bank ecosystems
- e. Present uses (including protection)
- f. Natural disasters
- g. Threats
- k. Possible measures (desirable for the maintenance of the ecological balance)

### AUSTRIA

- a. (i) 16 main rivers, of a total length of 3,000 km
- (ii) 75% mountainous and 25% plain
- b. (i) 1 river with large dams and 15 rivers with other hydraulic works
- c. Terrestrial ecosystems : 15% riparian forests, small percentage of thickets of reed, marshes and wet meadows
- Aquatic ecosystems : 80% salmonide, 20% cyprinide
- d. Terrestrial ecosystems : degradation caused mainly by commercial and agricultural activities
- Aquatic ecosystems : pollution from various sources (cyprinide)
- e. Recreation, navigation, agriculture, sport, industry, commerce and irrigation
- f. Seasonal floods
- g. Sedimentation in watercourses due to erosion
- k. Most suitable uses in order to avoid sedimentation, construction of reservoirs for flow control

### BELGIUM

- a. (i) Three main rivers of a total flow of  $12 \times 10^9$  m<sup>3</sup>/year ; total length of all watercourses 28,355 km
- b. (ii) 80% with regulating works
- c. Terrestrial ecosystems : 5% riparian forests
- 10% thickets of reed, marshes, wet meadows
- 15% bushes
- Aquatic ecosystems : 80% salmonide, 40% cyprinide
- e. Eutrophication, degradation due to pollution and hydraulic works
- f. Floods (not serious)
- g. Eutrophication due to hydraulic works
- k. Treatment of waste waters, conservation of the banks in as natural a state as possible

#### CYPRUS

- a. (i) No rivers, but 40 main streams of a total length of 1,500 km and mean annual flow of  $0.6 \times 10^9 \text{ m}^3/\text{year}$
- (ii) 80% mountainous, 20% plain
- b. All rivers with hydraulic works
- c. Terrestrial ecosystems : 14.4% riparian forests, small percentage of thickets of reed, marshes and wet meadows and 50% bushes  
Aquatic ecosystems : 2.5% salmonide
- d. Parts of riparian forests are affected by fires, reforestation, grazing and felling
- e. Timber production, recreation, protection of fauna and flora (for riparian forests only)
- f. Fires and floods
- g. Biocides (for salmonide ecosystems)

#### DENMARK

- a. (i) 5 main rivers, total length 44 km and mean annual flow of  $3.4 \times 10^9 \text{ m}^3/\text{year}$
- b. All rivers with hydraulic works and regulating works
- c. Terrestrial ecosystems : 10% riparian forests, 90% thickets of reed, marshes and wet meadows  
Aquatic ecosystems : It is impossible to subdivide the river ecosystems into salmonide and cyprinide zones because the ecosystems change within a very short distance
- d. The riparian alder forest is a natural evolution of the ecosystem along the river  
Reed beds evolve towards marshes and wet meadows, because of changes in the level of water and the plant communities  
The salmonide and cyprinide development depends on the flux of watercourses ; they are threatened by water level changes and pollution
- e. Deciduous forests for forestry (wood production), wet meadows and salt marsh areas for hay harvesting, cattle grazing, corn production and the whole river area for recreation
- f. Intensive draining of the surrounding wetlands, pollution due to fish farms and fertilisers

#### FRANCE

- c. No data available  
Sporadic occurrence of riparian forests

FEDERAL REPUBLIC OF GERMANY

- a. (i) 8 main rivers of a total length of 7,463 km and mean annual flow of  $159 \times 10^9$  m<sup>3</sup>/year
- b. (i) All main rivers with hydraulic works
- (ii) Many rivers affected by dykes
- c. Terrestrial ecosystems : riparian flood plain forests, thickets of reed, marshes and wet meadows
- e. Nature reserve, important resting, feeding and wintering area for endangered migratory species of waterfowl
- g.
  - Water pollution (many rivers entering the Federal Republic of Germany are already polluted and in some German areas they carry additional pollution resulting from insufficiently purified sewage effluents from households and industry, including a high content of heavy metals)
  - Important changes in the ecosystem caused by discharge of large quantities of saline waste water from potash mines in other countries (including Alsace)
  - Water engineering measures lead to the loss of biotopes for rare species, or of ecologically important areas such as freshwater mud flats, by raising soil
  - Draining and breaking up of the flood meadows and marshes
  - Increasing excavation activities and disturbances by aquatic sports and angling
  - Eutrophication caused by the leaching of mineral fertilisers

For the flood plain forests

- Lowering the groundwater table by the tapping of drinking water, cultivation of exotic wood species
- Construction of industrial plants in the area of the flood plain forests
- Large-scale gravel and sand extraction
- Uncoordinated construction of industrial plant
- Sinking groundwater table in near-shore areas as a result of deep erosion
- k.
  - Establishment of more nature reserves and sufficient buffer zones
  - Construction of more sewage purification plants
  - Deposition of spoil elsewhere than in ecologically valuable areas
  - Restriction or ban on motor-boating and camping activities, where appropriate
  - Keeping of grasslands and dwarf shrub heathlands free of tree and shrub vegetation
  - Reduction of water removal
  - Ban on gravel extraction in certain areas
  - Diversion of heavily polluted outlet channels
  - Restriction of waste waters from the potash mines in Alsace
  - Prohibition of angling in silting zones
  - Restriction of hunting activities near dams
  - Transport of detritus from dams into areas with heavy bed erosion

### GREECE

- a. (i) 26 main rivers of a total length of 2,513 km and mean annual flow of  $0.18 \times 10^9$  m<sup>3</sup>/year
- (ii) 78% mountainous, 22% plain
- b. (ii) 11 rivers with hydraulic works
- c. Aquatic ecosystems : Salmonide (total length 1,860 km)
- d. Degradation and disturbance caused by technical works, agriculture and pollution
- e. Agriculture, recreation
- f. Floods (not very frequent)
- g. Pollution, drainage, reclamation, over-cutting and over-grazing
- k. Forest management, controlled tourism and recreation

### IRELAND

- a. (i) 258 rivers of a total length of 12,000 km and mean annual flow of  $40 \times 10^9$  m<sup>3</sup>/year
- c. Terrestrial ecosystems : small percentage of riparian forests, 60% thickets of reed, marshes and wet meadows 10% bushes
- Aquatic ecosystems : 30-40% salmonide, 60-70% cyprinide
- d. Degradation of : alluvial forests due to commercial development thickets of reed, marshes and wet meadows by drainage for agricultural purposes bushes by drainage for agricultural purposes salmonide and cyprinide ecosystems by sewage and agriculture
- e. Recreation, shooting, agriculture (mainly pastures), fishing, waste disposal, water abstraction, forestry
- f. Seasonal floods (mainly in winter)
- g. Drainage, organic pollution originating in sewage and agriculture
- k. Multiple use, including wildlife and fishery uses

### ITALY

- a. (i) 36 main rivers of a total length of 6,885 km and mean annual flow of  $84 \times 10^9$  m<sup>3</sup>/year
- b. All main rivers and some secondary ones
- f. Floods
- g. Erosion

### LIECHTENSTEIN

- a. 6 main rivers of a total length of 77 km and mean annual flow of  $8.2 \times 10^9$  m<sup>3</sup>/year
- b. (i) All rivers with hydraulic works
- (ii) 100% with regulating works
- c. Terrestrial ecosystems : very small strip of semi-artificial bushes
- Aquatic ecosystems : mainly salmonide



LUXEMBOURG

- a. (i) 5 watercourses of a total length of 310 km
- (ii) 53% mountainous, 47% plain
- b. Many watercourses have regulating works or hydraulic constructions
- c. Remainers of riparian forests  
Aquatic ecosystems : 70% salmonide, 30% cyprinide
- d. Forest coverage (32% of the country area) remains stable  
Marshes and thickets of reed reduced to small areas because of measures to improve agriculture
- e. Riparian forests have been replaced by meadows and the remaining ones have no production value, though they are of great biological importance  
In the largest valleys, wet meadows have been and are still being drained. In the narrow valleys the meadows are reforested, mainly with conifers  
Aquatic ecosystems : fishing, recreation, navigation (on one canalised watercourse)
- f. Periodical floods, damage mainly in inhabited areas
- g. Accidental pollution or organic pollution
- k. Degraded banks and bare shores will be replanted.  
Ecological requirements must be taken into consideration during the carrying out of hydraulic works

MALTA

No rivers

NETHERLANDS

- a. (i) 5 main rivers of a total length of 735 km ; the mean annual flow of the Rhine and Meuse is  $77 \times 10^9$  m<sup>3</sup>/year
- b. (i) All the rivers have hydraulic works
- (ii) 100% with regulating works
- c. Terrestrial ecosystems : 10% riparian forests, 80% thickets of reed, marshes and wet meadows, 5% bushes  
Aquatic ecosystems : 100% cyprinide
- d. Terrestrial ecosystems :
  - wet meadows : along almost every river branch flooded at high level, used extensively for cattle grazing and hay production. Degradation due to occupation as recreation areas
  - thickets of reed along quiet river banks, especially in the estuaries, once valuable for reed crops for different uses but now less important. Enclosure of estuaries from the sea have diminished the surface of reed thickets dramatically in those areas
  - bushes : willow bushes have been planted in the estuary areas for centuries and were valuable for the branches ; now harvesting has stopped and the bushes are too old for that use.

d. (continued) Aquatic ecosystems :

- Dutch rivers are the downstream part of much larger rivers and thus have only cyprinide ecosystems. Until 1930 these parts were important as migration routes for salmonides and other fishes, but because of the deterioration of rivers and river banks and water pollution, such fish are seldom found nowadays.

- e. Angling
- f. Periods of drought
- g. Recreation and shipping (for the terrestrial ecosystems) ; pollution and canalisation (for aquatic ecosystems)

NORWAY

- a. (i) 8 main rivers of a total length of 1,939 km and total annual mean flow of  $76 \times 10^9$  m<sup>3</sup>/year
- b. (i) Many rivers with hydro-electric developments (multiple purpose reservoirs)
- (ii) Regulating works in many parts of the banks
- f. Frequent floods, erosion, landslips
- g. Pollution, hydro-electric works

PORTUGAL

- a. (i) Mainland : 16 main rivers of a total length of 2,367 km and total annual flow of  $67 \times 10^9$  m<sup>3</sup>/year  
Madeira : 12 streams and torrents of a total length of 90.5 km  
Azores : 18 streams and torrents of a total length of 73.8 km
- (ii) Mainland : 70% mountainous, 30% plain (region north of Tejo)  
40% mountainous, 60% plain (Tejo)  
25% mountainous, 75% plain (region south of Tejo)  
Madeira and Azores autonomous regions : 100% mountainous
- b. (i) Mainland : all rivers with hydraulic works  
Madeira : Small number of streams and torrents with hydraulic works  
Azores : 5 streams with hydraulic works
- c. Terrestrial ecosystems : the percentage of banks covered by forests varies between 5 and 40% in the rivers in the plains and the mountains (Guadiana and Ave respectively)
- Aquatic ecosystems : Salmonide (Azores)
- d. Terrestrial ecosystems : natural riparian forests are being progressively replaced by forests of exotic species or of species for intense industrial exploitation ; the area of thickets of reed, marshes and wet meadows and bushes tends to diminish because of human activities, embankments and regulating works

- d. (cont.) Aquatic ecosystems :
  - Mainland : pollution is the main reason for the degradation of aquatic ecosystems
  - Azores : pollution is the main reason here also
- e. Terrestrial ecosystems : timbering (data available for the mainland and the Azores)
- f. Aquatic ecosystems : fishing (data available for the Azores)
- f. Mainland : Drought, occurring probably every fifteen years ; floods probably every sixty years
- Madeira : landslips due to floods or the absence of forests
- Azores : landslips due to earthquakes or floods
- g. Pollution, erosion, sedimentation, human activities
- k. The protection of natural banks and the restoration of degraded zones are very important measures that must be taken
- Human intervention should be reduced

#### SPAIN

- a. (i) The total length of the rivers is 66,743 km and the mean annual flow is  $90 \times 10^9$  m<sup>3</sup>/year
- b. Many rivers have various regulating works
- c. Terrestrial ecosystems : 20% riparian forests, 30% thickets of reed, marshes and wet meadows, 40% bushes
- Aquatic ecosystems : 25% salmonide, 75% cyprinide
- f. Floods (every ten years) and droughts (every 25 years)
- g. - Impact of hydraulic works on aquatic and terrestrial ecosystems
- Drainage of marshy areas
- Pollution, eutrophication
- Extended erosion due to constant deforestation for agriculture and grazing purposes

#### SWEDEN

- a. (i) 42 main rivers of a total estimated length of 42,413 km
- b. Almost all rivers with hydraulic works (hydroelectric power plants)
- c. Hydroelectric power production, fishing
- f. - The effect of heavy precipitation, intensive snow melt or long droughts is not regarded as a serious problem, since most rivers are controlled
- Landslips (in areas of clays with high organic content and water content)
- Erosion of the sandy-silty material deposited in the gullies during and after the last Ice Age
- g. - Impact from hydraulic works
- Changes of climatological conditions as a consequence of the damming of water
- Changes in the amount of suspended matter transported has a negative effect on the bottom-living fauna

- g. (cont.) - The raised water levels in reservoirs make the groundwater level rise and this in certain cases leads to swamping of forest areas
- Increased fish production, immediately after the construction phase of hydraulic works and final stabilisation, on a usually lower level of the fish production than prior to the hydraulic works
- Pollution from household sewage, industrial waste waters and fertilisers used in farming
- Deposit of airborne emissions causing continual acidification (40-50% of the deposited acid originates outside Sweden). The most severe effect on the river ecosystem occurs during spring when melting of the snow cover gives rise to very low pH values, which are harmful to aquatic animals
- k. Research project, concerning the effects of erosion in regulating reservoirs and river stretches affected by regulating works

#### SWITZERLAND

- a. (i) 3,080 rivers longer than 1 km each, with a total length of 21,200 km and a mean annual flow leaving Switzerland of  $50 \times 10^9$  m<sup>3</sup>/year
- (ii) 40% mountainous and 60% plain
- b. (i) Large proportion of rivers with hydraulic works
- (ii) 33% of the rivers with regulating works
- c. Terrestrial ecosystems : approximately 27% riparian forests, small percentage of thickets of reed, marshes and wet meadows
- Aquatic ecosystems : 90% salmonide and 10% cyprinide
- d. Riparian forests were cleared (13th - 14th century) for pastures and meadows for intensive cattle breeding. After the Second World War these areas were only reforested in cases where they could not be used for modern agriculture. There are practically no thickets of reed because of the flux of watercourses. More than 99% of wet meadows are of human origin (litter production) but they are decreasing sharply nowadays because they are given over either to intensive agriculture or building.
- e. In general, legislation demands the conservation of natural banks. The riparian vegetation is totally protected, with the exception of cases where there is overriding public interest. Deforestation and clear-cutting are forbidden by forestry legislation.
- f. Dangerous floods ; the danger has been greatly reduced as a consequence of protective and regulating works
- g. Mountain areas : removing and storing water for hydroelectric production
- Plains : regulating works, gravel removal, pollution, navigation, forestry, recreation
- k. - River ecosystems which are still preserved should be protected against all human interference
- On natural, semi-natural banks, new works must be permitted only for the security of the population or for protection of land already used by man
- Development aimed at gaining new land, for any use, is not advisable and if it is absolutely necessary, an environmental impact assessment or landscape study should be carried out first
- Serious consideration should be given to the ecological aspects of navigation projects before any decision is taken
- An efficient state control body is indispensable

TURKEY

- a. (i) 24 main rivers (longer than 250 km each), of a total length of 12,219 km
- (ii) 95% mountainous, 5% plain
- b. 68 rivers with large dams and 17 rivers and canals with hydro-electric power stations
- c. Terrestrial ecosystems : 50% riparian forests, 15% thickets of reed, marshes and wet meadows  
Aquatic ecosystems : 30% salmonide, 70% cyprinide
- d. - Most of the riparian forests (in coastal plains) have been cleared for agriculture  
- Some of the wet meadows have been drained  
- Wet meadows' flora has also been diminished because of frequent floods
- e. Irrigation, fisheries, recreation, pastures, agriculture
- f. Floods (small rivers and creeks)
- k. Regulating river flow constructions for avoidance of sedimentation and floods

UNITED KINGDOM (GREAT BRITAIN ONLY)

- a. The total length of the main rivers under Water Board control is 80,860 km (28,147 in England, 5,374 in Wales and 47,279 km in Scotland). The mean annual flow of Scottish rivers is  $73 \times 10^9$  m<sup>3</sup>/year
- b. (i) All the main rivers and about 700 tributaries with hydraulic works
- (ii) Substantial percentage with regulating works
- c. Terrestrial ecosystems : 15% riparian forests, 30% thickets of reed marshes and wet meadows, 15% bushes  
Aquatic ecosystems ; 67% salmonide, 33% cyprinide
- g. Improvement schemes (for drainage purposes) for domestic and industrial effluents
- k. - Successful draining of forest areas is necessary in order to avoid sedimentation in rivers and reservoirs  
- Maintenance and improvement of natural vegetation

A P P E N D I X 3

LAKES - LAKE SHORES

- a. (i) Number - Total area (ha)
- (ii) Types of lakes
- b. Types of ecosystems
- c. Evolution
- d. Present uses (including protection)
- e. Natural disasters
- f. Present threats
- g. Possible measures (desirable for the maintenance of the ecological balance)

AUSTRIA

- a. (i) 22 lakes of more than 2 km<sup>2</sup> each and a total area of 120,000 ha
- (ii) 5 Alpine, 16 other mountainous, 1 plain
- b. Terrestrial ecosystems : 12% hygrophilous forests, small percentage of thickets of reed, marshes and wet meadows
- c. Change of trophic status from eutrophic to oligotrophic as a result of advanced waste water treatment technologies
- d. The natural lakes are situated in a protected area - recreation, farming, housing
- f. Anthropogenic influences
- g. Conservation of biotopes, further increase in pollution control

BELGIUM

No natural lakes

CYPRUS

- a. (i) 2 lakes of a total area of 1,570 ha
- (ii) 2 salty
- b. Aquatic ecosystems : 5% with emergent vegetation and 95% with no vegetation
- d. Source of edible salt for the country

DENMARK

- a. (i) 1,008 lakes of a total area of 43,428 ha
- (ii) Almost all are plain, few of them are alkaline
- b. Terrestrial ecosystems : the main part consists of thickets of reed, marshes, wet meadows and the rest of hygrophilous forests
- Aquatic ecosystems : mostly with vegetation
- c. Reed-beds evolve towards marshes and wet meadows. The immigration of different plant communities, caused by a change in the climate, has modified the lake to its present form ; this process will continue until its transformation into a bog.
- d. Wet meadows are used for the production of hay, grazing and recreation
- e. Pollution from domestic and industrial effluents : intensive use of fertilisers in farming ; filling up of small lakes
- f. Pollution control

FRANCE : 36 main lakes of a total area of more than 68,000 ha

FEDERAL REPUBLIC OF GERMANY

- a. (i) More than 337 lakes of a total area of more than 109,424 ha
- (ii) 24 mountain lakes (81,710 ha) and more than 315 plain (27,714 ha)
- b. Terrestrial ecosystems : hygrophilous forests, thickets of reed, bushes, marshes and wet meadows
- Aquatic ecosystems : with vegetation
- c. Most of the big natural lakes are situated in the area of former glacial regions in north and south Germany. Owing to the natural genesis and to strong anthropogenic influences most lakes are eutrophic (some of them are hypertrophic). The ologotrophic lakes are extremely rare, highly endangered and consequently particularly worthy of protection. Some crater lakes have become boggy.
- d. Fisheries, recreation, breeding area for endangered bird species, important resting and wintering area for numerous waders and waterfowl, nature park with a large proportion of protected landscapes.
- f.
  - Industrialisation of near-shore areas
  - Intensive tourism on the shores of the lakes
  - Increasing use of the lakes for aquatic sports and recreation
  - Permanent influx of nutrients from farmland, in particular to ologotrophic waters
  - Heavy ship traffic
  - Eutrophication due to the discharge of domestic sewage effluents (only for crater lakes) and the influx of mineral fertilisers
  - Unrestricted hunting activities
  - Draining and peat extraction in adjacent bogs
  - Large production of mud owing to the construction of dykes
  - No regular flooding of adjacent areas because of the construction of dykes
  - Harbour installations, housing
  - Change in scenic unity of crater lake rampart, resulting from the extraction of pumice stone at the edge of the crater
- g.
  - Restriction of water craft and recreational boating where appropriate
  - Establishment of more nature reserves in the area of ologotrophic lakes
  - Continuation of the endeavours to prevent pollution of the waters of the lakes
  - Harmonisation of different hunting regulations
  - Designation of lake districts as "wetlands of international importance"
  - Replanting of bushes and reeds
  - Establishment of game reserves
  - Restriction of peat extraction
  - Reduction of the permanent large influx of nutrients, (carried by river) by construction of sewage purification plants
  - Continuation of the measures for the removal of sludge
  - Cessation of the granting of permits for the construction of harbour installations, piers and weekend houses
  - Maintenance of traditional agriculture and forestry in the areas surrounding the lakes, if necessary by governmental subsidies.

GREECE

- a. (i) 38 lakes of a total area of 52,300 ha
- (ii) 7 mountainous (21,000 ha) and 31 plain (31,420 ha)
- c. Agriculture, housing and recreation
- d. No significant natural disasters
- e. Pollution, agriculture, over-cutting, drainage, over-grazing, housing
- f. Forest management, pollution control, controlled tourism, recreation

IRELAND

- a. (i) 53 great lakes of a total area of 84, 462 ha
- (ii) 10% mountainous and 90% plain
- f. Agricultural reclamation, peat exploitation, drainage and water pollution
- g. Maintain the ecosystems in present ecological condition

ITALY

- a. (i) 10 main lakes of a total area of 134,800 ha
- (ii) Alpine, prealpine and volcanic
- b. The activity of glaciers has brought about some evolution of the prealpine lakes

LIECHTENSTEIN

- a. 3 small ponds of a total area of 3.5 ha
- d. The three ponds are protected

LUXEMBOURG No lakes

MALTA No lakes

NETHERLANDS

- a. (i) 5 lakes of a total area of 211,045 ha
- (ii) 1 salty, 1 brackish
- b. Terrestrial ecosystems : no hygrophilous forests, 80% thickets of reed, marshes and wet meadows ; less than 5% bushes
- Aquatic ecosystems : less than 20% with vegetation and more than 65% without vegetation
- c. The terrestrial ecosystems of most of the lakes have been formed more or less on the basis of artificial measures. The existence and development of aquatic ecosystems are related to the artificial character of most of the lakes. Heavy eutrophication in most lakes has caused the disappearance of emergent and submerged water plants and the occurrence of blooms of algae everywhere, especially during the last 20 years.



- d. Commercial fishing and angling ; harvesting reeds for thatch
- e. Droughts (once every 10 - 20 years)
- f. Angling, dredging for sand, lowering of the water level in adjacent areas, pollution (including eutrophication), intensive recreational use of all lakes and lake shores
- g. Restoration and balanced use of areas is very important

#### NORWAY

- a. 211,000 lakes of a total area of  $1,640 \times 10^3$  ha
- c. Changes in communities of plants and fish
- d. Agriculture, industry, various recreational and conservation purposes
- e. Glacial activity
- f. Acidification of the water by acid rain, pollution caused by industry, agriculture and sewage
- g. Pollution control measures (national and international)

#### PORTUGAL

- a. (i) 54 lakes (ponds included) of a total area of 1,499 ha
- (ii) Mountainous (14 lakes on the mainland, all those in the Azores)
- b. Data available only for the Azores Autonomous Region
- Terrestrial ecosystems : thickets of reed, marshes and wet meadows
- Aquatic ecosystems : with vegetation
- c. Mainland : human activities (agriculture and urbanisation) and the discharge of untreated effluents are the main causes of eutrophication
- Azores : degradation of lake shore ecosystems by grazing
- d. Housing, tourism, agriculture, grazing
- e. Droughts, floods, earthquakes
- f. Eutrophication, housing, tourism
- g. Complete studies of ecosystems

#### SPAIN

- a. Natural lakes are rare ; 700 artificial lakes of a total area of 200,000 ha

#### SWEDEN

- a. (i) 50,000 lakes greater than 1 ha each, of a total area of  $34,323 \times 10^3$  ha
- (ii) Alpine, other mountainous and the majority Scandinavian
- c. The accelerated production of biomass increases the growth rate of the bottom sediments which means that the aging of the lake is speeded up
- d. Housing
- f.
  - Pollution from household sewage, industrial waste water
  - Eutrophication due to the high input of nitrogen and phosphorus, mainly from sewage and agriculture
  - Deposit of airborne emissions leading to continual acidification (40-50% of the acid originates outside Sweden)
  - Private holiday houses
  - Erosion

#### SWITZERLAND

- a. (i) 70 lakes greater than 10 ha each (28 of them greater than 50 ha each) of a total area of  $4.08 \times 10^5$  ha
- (ii) 29 alpine (123,085 ha), 3 other mountainous (1,000 ha) in the Jura, 9 plain (86,390 ha)
- b. Terrestrial ecosystems : only 5% of banks with hygrophilous forests, thickets of reed, marshes and wet meadows in an undisturbed state  
Aquatic ecosystems : 75% of banks with vegetation of macrophytes
- c. Change of water meadows and marshes into agricultural land. Until 1902, cutting down of riverside forests. Degradation of reed-beds because of regulating works, pollution and navigation
- d. Recreation, tourism
- f. Recreation, housing, road and railway construction, pollution from agriculture, erosion
- g. Strict protection of nearly natural lake shores against recreation, housing, navigation, pollution from agriculture. Strengthening of local authorities. Studies on the evolution of ecosystems

#### TURKEY

- a. 48 lakes larger than 5 km<sup>2</sup> each, of a total area of 889,700 ha
- b. Terrestrial ecosystems : less than 1% hygrophilous forests  
94% thickets of reed, marshes and bushes  
5% bushes
- d. Protected areas, recreation, fishing, sources of drinking water
- e. Floods, earthquakes, landslips, drought
- f. Drainage
- g. Physical planning studies for the lakes used as drinking water sources. A number of lakes have been put under protection.

#### UNITED KINGDOM (GREAT BRITAIN ONLY)

- a. (i) 5,505 lakes and reservoirs (1,790 natural lakes in Wales ; 3,500 water bodies in Scotland)
- (ii) Alpine, other mountainous, plain
- d. Recreation, various hydraulic works
- f. Eutrophication, recreation, reservoir construction and hydroelectric schemes
- g. High nature conservation interest

A P P E N D I X 4

LAGOONS - LAGOON SHORES

- a. Number of main lagoons, total area (ha), length of lagoon shores (km), area (ha) of their coastal zone
- b. Number of lagoons and total percentage of length of their shores with regulating works
- c. Percentage of lagoon shore which is natural, semi-natural, artificial
- d. Present trophic status and evolution
- e. Present uses (including protection)
- f. Natural disasters
- g. Present threats
- h. Desirable (and possible) uses of lagoon ecosystems and ecological balance of these ecosystems

AUSTRIA            No lagoons

BELGIUM            No lagoons

CYPRUS            Data not available

DENMARK

- a. 4 main lagoons of a total area of 91,000 ha and total length of 500 km, 150,000 ha
- b. 7 lagoons with regulating works (dykes, canals, sluices)
- c. 90% natural and 10% artificial
- e. Fishing, recreation, outlet of domestic sewage and industrial waste water
- f. Floods due to break-through of the dykes
- g. Water level changes, human activity

FEDERAL REPUBLIC OF GERMANY

- a. Large shallow-water areas near the Baltic coast
- g. Pollution due to sewage discharge from neighbouring states of the Baltic, increased recreational use
- h. Construction of more sewage purification plants in all countries bordering the Baltic  
Construction of more recreational facilities - if at all - only in agreement with the nature conservation authorities  
Establishment of more nature reserves of reasonable size  
Declaration of these shallow-water areas as a "wetland of international importance"

FRANCE

- a. 20 lagoons of a total area of 80,000 ha and total length of 600 km
- e. Urbanisation, industry, shellfish growing area

GREECE

- a. 24 lagoons of a total area of 24,500 ha and total length of 350 km, 3,500 ha
- c. 10% natural, 85% semi-natural, 5% artificial
- e. Aquaculture, agriculture, recreation
- f. Floods (to a limited extent and not frequent)
- g. Pollution, agriculture, instability of water level, wave action and overgrazing
- h. Controlled management of aquaculture, agriculture, grazing and recreation

IRELAND

- a. The total area of lagoons is approximately 2,500 ha and the total length approximately 60 - 100 km
- b. Some lagoons have regulating works
- c. 100% natural
- d. Oligotrophic or mesotrophic generally, but also some brackish
- e. Wildlife, shooting, fishing
- f. None
- g. Drainage and agricultural reclamation works
- h. Maintain in present ecological condition; mariculture

ITALY

- a. The total area of lagoons is approximately 124,826 ha
- e. Hunting, fisheries, nature reserves

LIECHTENSTEIN No lagoons

LUXEMBOURG No lagoons

MALTA No lagoons

NETHERLANDS

- a. 1 main lagoon (Wadden Sea) of a total area (Dutch part) of approximately 225,000 ha
- b. 50% with hydraulic works (dykes), mostly important
- c. Mostly natural, semi-natural
- d. Mesotrophic, varying from oligotrophic (near the sea entrances) to eutrophic (in the ends of the smaller arms of the sea)

The present ecosystem, formed by intrusion of the sea through a dune coast 20 to 15 centuries ago, can be called "full grown" now; terrestrial ecosystems are very rich in saline vegetation and aquatic ones are rich in species, individuals and vegetation. The very large area of shallow water is a feeding area for the juvenile stages of sea organisms. Because of nature conservation priorities, the building of dykes on the lagoon shores for agricultural purposes has been almost entirely stopped. The vegetation on the highest mud and sand flats is extensively grazed by cattle.

- e. Land reclamation of the border parts, fisheries, sand extraction, digging of cockle shells, angling, recreation, military uses, gas and oil drilling (occasionally)
- f. Heavy storms and high floods
- g. Pollution, originating from industrial wastes  
Sedimentation of coastal sea due to silt which carries heavy metals and pesticides  
Human activities
- h. All activities must be carried out according to the existing management plans, ensuring the conservation of the environment, the habitats, the ecosystems and the landscape

#### NORWAY

No lagoons of any significance

#### PORTUGAL

- a. Mainland: 9 lagoons of a total area of 19,935 ha and total length of 496.2 km  
Azores Autonomous Region: 2 lagoons of a total area of 19,25 ha and total length of 3 km  
Madeira Autonomous Region: No lagoons
- b. Mainland: 11% with regulating works (data available for 3 lagoons only)  
Azores Autonomous Region: No regulating works
- c. Mainland: 14.77% - 71% natural, 11.62% - 30% semi-natural, 61.91% - 14.1% artificial  
Azores Autonomous Region: 75% natural, 25% semi-natural
- d. Oligotrophic (Lagoon de Mira)

#### SPAIN

- a. 51 lagoons, of a total area of 30,710 ha
- f. Droughts
- g. Drainage, pollution due to waste waters, urbanisation, lowering of the bottom level

#### SWEDEN

No lagoons of any significance

#### SWITZERLAND

No lagoons

TURKEY

- a. The total length is 190 km and the total area of coastal zone is 21,000 ha
- c. 95% natural, 4% semi-natural, 1% artificial
- e. Recreation and commercial fishing
- f. No natural disasters
- g. Overfishing

UNITED KINGDOM (GREAT BRITAIN ONLY)

- a. Lagoons are a relatively rare habitat type in Britain

A P P E N D I X 5

RIVER MOUTHS : DELTAS AND ESTUARIES

- a. Total area (ha) of deltas and estuaries, total length and width (km x km) of each delta and estuary
- b. Number of deltas and estuaries and percentage of their total area with regulating works
- c. Percentage of delta and estuary areas which are natural, semi-natural, artificial
- d. Present trophic status and evolution
- e. Present uses

AUSTRIA            No river mouths

BELGIUM

- a. No deltas
- One estuary of a total area of 250 ha (3 km by 0.15 km)
- c. 40% natural, 20% semi-natural, 40% artificial
- e. Yachting, military zone, nature reserve

CYPRUS            No significant deltas or estuaries

DENMARK

- a. No estuaries
- One delta of a total area of approximately 4,000 ha (8 km x 6 km)
- b. 97% have been drained
- c. 3% semi-natural, 97% artificial
- d. The delta area has been built up during periods of varying sea levels which have affected the composition of sediments. The delta consists of brackish sediments and freshwater sediments
- e. Agriculture, fishing, recreation

FEDERAL REPUBLIC OF GERMANY

- a. One delta and three estuaries
- e. Deltas : establish nature reserves  
designate the area as a "wetland of international importance"  
intensify the extension of sewage purification plants  
settle the problem of waste water from the potash mines in Alsace  
Estuaries : establish more nature reserves  
construction of more sewage purification plants  
concentrate soil extraction  
prohibit drainage of the land

FRANCE

- a. One delta, three main estuaries of a total length of 766 km
- d. All estuaries have been considerably modified by the establishment of industrial zones and harbour constructions

GREECE

- a. No estuaries. 8 deltas of a total area of 10,512 ha (15 km x 8 km), (2 km x 4 km), (2 km x 3 km), (1.5 x 3.5 km), (4 x 2.5 km), (10 x 5 km), (6.5 x 10 km), (6 x 9 km)
- b. 10% of delta areas have regulating works (4 deltas only)
- c. 60% natural, 34% semi-natural, 6% artificial
- e. Agriculture, fisheries, grazing

IRELAND

- c. Estuaries : 80% natural, 19% semi-natural, 1% artificial
- d. Mildly eutrophic in upper reaches (for 5 studied estuaries)
- e. Transport, harbours, amenity uses, nature conservation

ITALY

- a. One major delta consisting of five active branches
- d. Recently formed, consisting of a series of littoral sand bars and abandoned river beds. Man's intervention upset the general balance, causing mainly the lowering of the soil level due to extraction of water and natural gas. During the last century many areas of the deltas were taken for land reclamation. The installation of a nuclear power station caused perhaps the biggest ecological controversy.
- e. Extraction of waters and oil, land reclamation, exploitation of the water table, installation of nuclear power station

LIECHTENSTEIN      No river mouths

LUXEMBOURG      No river mouths

MALTA      No river mouths

NETHERLANDS

- a. 2 estuaries of an area of 450,000 ha (60 x 65 km), (40 x 12 km)
- b. 7.5 % with regulating works
- c. 100% artificial
- d. All estuaries are eutrophic, Deltas contain several large branches and arms of the sea.



- d. (contd) Ecological evolution of :
- freshwater parts of estuaries : these are the lower reaches of large river systems. For many decades past the water has been eutrophic with a rich growth of typical plants and other organisms. The adjacent ground is very fertile (river clay and river sand) and is used for agriculture. This process started ten years ago and will last for the next 50 - 100 years.
  - brackish parts of estuaries : because of their great width cities have sprung up here, and industries since 1930. Since 1950 all shores have become artificial so as to permit shipping. They are heavily eutrophic and polluted.
  - almost entirely saline parts of estuaries : two of them, with long shorelines, are mesotrophic and have a function as feeding grounds for juvenile stages of sea organisms
  - sea arms : one large sea arm is less polluted than the above-mentioned saline parts of estuaries
  - enclosed sea arms : formed by the Delta works, 10 - 20 years ago. Mesotrophic due to municipal and agricultural wastes, and oligotrophic. Stratification occurs, due to salt content and temperature differences.
- e. Water management, navigation, industry, agriculture, recreation, marine cultures.

#### PORTUGAL

- a. 14 estuaries, of a total area of 52,026 ha (12 estuaries)  
(28 x 2,300 km), (4 x 0,620 km), (2 x 0.120 km), (18 x 1,300 km),  
(8 x 0.1 km), (12 x 0.62 km), (3 x 0.1 km), (79 x 13 km),  
(43 x 5 km), (19 x 0.45 km), (2.5 x 0.8 km), (14 x 1 km),  
(49 x 0.75 km)
- b. All estuaries with regulating works
- c. 0.19% - 38.85% natural  
6.3% - 75.66% semi natural  
1.7% - 88.7% artificial

#### SPAIN

- a. 16 river mouth areas of a total area of 18,820 ha
- e. Alteration of their morphology as a consequence of hydraulic installations in the watercourses near the deltas

#### SWEDEN

- a. One large coastal delta of a total area of 1,000 ha (5 x 4 km)
- b. No regulating works in deltas and estuaries
- c. Delta area : 40% natural, 30% semi-natural, 30% artificial  
Estuaries : 50% natural, 30% semi-natural, 20% artificial  
(one estuary 100% natural)
- e. Delta area : airport, roads, houses, recreation  
Estuaries : harbour, recreation, holiday houses

SWITZERLAND

- a. No estuaries ; 4 lake deltas of modest dimensions, with a total area of 4,200 ha

TURKEY

- a. 4 deltas of a total area of 220,600 ha  
(25 x 40 km), (25 x 40 km), (45 x 60 km), (40 x 50 km)
- b. All deltas with irrigation systems
- c. 2% natural (agricultural land)  
3% semi-natural  
95% artificial
- d. Eutrophic
- e. Farm lands

A P P E N D I X 6

OTHER WETLANDS : (I) PEATLANDS, (II) INLAND MARSHES, SWAMPS OR PONDS  
(III) COASTAL MARSHES

- a. Total area (ha) of I, II and III
- b. Number of I, II and III affected by hydraulic and land reclamation works
- c. Percentage of I, II and III which is natural, semi-natural, artificial
- d. Evolution of ecosystems
- e. Uses (including protection)
- f. Threats

AUSTRIA

- f. Roads, watercourses, management works

BELGIUM

- a. Peatlands : 4,000 ha
- b. No regulating works
- c. 100% natural
- e. Nature reserves
- f. Excessive tourism

- CYPRUS                      No wetlands of these types

DENMARK

- a. Peatlands, inland marshes, swamps, ponds and coastal marshes of a total area of 34,000 ha
- b. A very large part of these areas is affected by hydraulic and land reclamation works
- c. I : mainly seminatural and artificial. Small part natural  
II : semi-natural (major part)  
III : 90% semi-natural or artificial
- e. Agriculture, grazing and hunting
- f. Drainage, lowering of water table caused by water use, pollution and land reclamation for agriculture

FEDERAL REPUBLIC OF GERMANY

- a. Coastal marshes, inland marshes, peatlands, bogs, fens, ponds
- e. Nature reserve, hunting ; resting, wintering and breeding area for endangered species (eg waders, waterfowl), peat extraction
- f. Floods, excessive peat exploitation, construction of dykes, marine pollution, hunting, pollution resulting from insufficiently purified domestic sewage or industrial waste water with high content of heavy metals. Draining, large scale gravel and sand extraction, excessive occurrence of mute swan, eutrophication

#### FRANCE

- a. 900 peatlands  
35 main swamps (greater than 100 ha each) ; total area  
71,716 ha
- c. Peatlands : natural or semi-natural
- e. Forestry, agriculture
- f. Conifer plantations, drainage

#### GREECE

- a. Marshes and swamps (inland and coastal) of a total area  
of 70,900 ha
- d. Drainage, agriculture and grazing are the main causes of the  
degradation of these ecosystems
- e. Mainly grazing and, to a lesser extent, agriculture
- f. Over-grazing, drainage, fires

#### IRELAND

- a. Peatlands of a total area of 958,000 ha  
Inland marshes cover 5% of surface area  
Coastal marshes cover 2% of surface area
- b. Peatlands : 50% affected by hydraulic and land reclamation works  
Inland marshes : 4% affected by hydraulic and land reclamation  
works  
Coastal marshes : less than 1% being used as a dumping area
- c. Peatlands : 5% natural, 55% semi-natural, 40% artificial  
Inland marshes : 60% natural, 30% semi-natural, 10% artificial  
Coastal marshes : 80% natural, 19% semi-natural, 1% artificial
- d. Peatlands : turf cutting and afforestation  
Inland marshes : arterial drainage and reclamation for  
agriculture  
Coastal marshes : pollution and refuse dumping
- e. Peatland and inland marshes : some grazing, peat removal,  
afforestation  
Coastal marshes : some grazing and refuse dumping
- f. Peatlands : turf cutting, afforestation  
Inland marshes : arterial drainage and reclamation for  
agriculture  
Coastal marshes : arterial drainage

#### LIECHTENSTEIN

- a. Great part of the remaining 160 ha of wetlands is marshy
- b. Due to land reclamation for agriculture, the 2,000 ha of  
wetlands which existed in the 19th century have been reduced  
to an area of 160 ha, which is now of great botanical and  
zoological importance
- e. Nature reserve

#### LUXEMBOURG

- a. About 100 ha wetlands (reed-beds, marshes)
- b. Some of these small wetlands are threatened by agriculture or filling with dumped material
- c. Natural or semi-natural state
- e. Creation of nature reserves
- f. Organic pollution, destruction of the natural environment

#### MALTA

- a. Coastal marshes ; one major area of 7 ha and other very small areas
- c. 100% natural
- d. In the past the major area was leased to private individuals for hunting, Peripheral degradation was caused by the gradual encroachment of agricultural activities. It is now under legal protection
- e. Nature reserve
- f. No threats

#### NETHERLANDS

- a. Peatlands ; approximately 20,000 ha  
Inland marshes, swamps and ponds : 125,000 ha  
Coastal marshes : 8,000 ha
- e. Recreation, conservation, nature reserve
- f. Intensive recreation, land reallocation plans

#### NORWAY

- a. Bogs : Total area of 3,010,000 ha
- d. From 1966 to 1976, an average of 10,000 ha of bogland was drained annually, In 1976 a total of 400,000 ha was reclaimed. In recent years the rate of reclamation has declined
- e. Pastures, forestry
- f. Land reclamation

#### PORTUGAL

- a. Mainland : peatlands - 1,040 ha ; coastal marshes - 28,449 ha  
Madeira Autonomous Region : data not available  
Azores Autonomous Region : data not available
- c. Mainly natural and semi-natural
- d. Degradation due to infrastructure works, drainage, transformation for agricultural purposes
- e. Agriculture
- f. Sedimentation, deposition of refuse, pollution, infrastructure, transformation for agricultural purposes

#### SPAIN

- a. 31 marshes (mostly swamps) of a total area of 108,530 ha
- d. Degradation due to draining for agricultural purposes
- e. Agriculture (rice culture), establishment of human settlements
- f. Drainage. Establishment of human settlements. Pollution due to fertilisers, pesticides, domestic sewage and industrial waste waters

#### SWEDEN

- a. At least 3,600 wetland areas with a total of 800,000 ha. Their size varies from less than 10 ha to approximately 100,000 ha (Scandinavian mountain regions not included).
- d. In some agricultural districts in southern and central Sweden, many of the wetlands have been drained and used for other purposes. This has been going on since the early 19th century
- e. Forestry, agriculture, energy production, hunting, fishing, bird-watching, educational and scientific purposes
- f. Plantations, regulating works, intensive ditching and fertilising, peat cutting

#### SWITZERLAND

- a. Peatlands : 300 - 500 in number with a total area of 500 ha  
Marshes : 2 in number with a total area of 450 ha
- c. Peatlands : 5% natural, 95% semi-natural
- d. Peatlands : intensive exploitation up to World War I caused the disappearance of most of the peatlands. Together with drainage, this caused the degradation of 91% of the peatland area,  
Marshes : most have been drained for agriculture and only about 10 - 15% of those existing in the period from the 10th to the 14th century still remain
- e. Peatlands : peat exploitation  
Marshes : agriculture
- f. Peatlands : drainage, peat exploitation  
Marshes : drainage

#### TURKEY

- a. No peatland or coastal marshes ; one inland marsh
- c. 95% natural, 4% semi-natural, 1% artificial
- d. Land reclamation, over-grazing, over-fishing and hunting are causes of degradation
- e. Grazing, fishing, recreation, agriculture
- f. Drainage, fishing, sedimentation, over-fishing, pollution

UNITED KINGDOM (GREAT BRITAIN ONLY)

- a. The total area of fen, bog and river meadows habitat is 86,500 ha; Salt marshes cover a total area of 4,500 ha
- d. The total area of the above biotopes has been extensively reclaimed in the past, mainly for agricultural purposes. Nowadays, reclamation is for industrial, urban and defence purposes
- e. Drainage, dams, pollution

A P P E N D I X 7

BIOTOPES AND PROTECTED AREAS

AUSTRIA

Five sites have been declared "wetlands of international importance", according to the Ramsar Convention.

BELGIUM

- Marine dunes : Westhoek nature reserve (La Panne)
- Brackish water areas : Zwin nature reserve (Knokke-Heist)
- Freshwater areas : Blankaart nature reserve (Woumen) and Kalmthout nature reserve
- Peatlands : Hautes Fagnes and Plateau des Tailles nature reserves

CYPRUS

20 acres of green turtle breeding habitat (sandy beach on the west coast) are protected.

DENMARK

There are 593,500 ha of potentially valuable humid areas, 24,657 ha of which are protected and 11,589 ha are game reserves. In addition, there are 67,450 ha of other protected sites (bogs, dunes, streams, lakes, marshes, reeds, etc). Some biotopes are included in the Ramsar Convention.

FRANCE

There are numerous biotopes of importance in rivers, lakes, lagoons, etc. There is also a number of nature reserves mainly for the protection of birds. The following list gives the sites which are official wetland nature reserves :

Lac Luitel  
Tourbière de Mathon  
Etang Noir  
Marais du Bout du Lac d'Annecy  
Camargue  
Les Sagnes de la Godivelle  
Roque Haute  
Etang de l'Estagnol  
Mare de Vauville  
Etang du Cousseau  
Saint-Denis du Payre  
Etang de Saint-Ladre  
Domaine de Beauguillot  
Delta de la Dranse  
Pinail  
Lilleau des Niges (Fiers d'Ars)  
Remoray  
Grand Lieu  
Marais d'Yves  
Courant d'Huchet  
Marais d'Isle



#### FEDERAL REPUBLIC OF GERMANY

The total protected area (nature reserves) covers 235,941 ha, including part of the Wadden Sea (216,298 ha). The species protected are birds (mainly aquatic), plants, amphibians and reptiles. 17 sites have been declared "wetlands of international importance" according to the Ramsar Convention and 18 others can be considered potential "wetlands of international importance".

Coastal regions : nature reserves of a total area of 219,000 ha and two game reserves with a total area of 60,000 ha, as follows :

North Sea coast of Schleswig-Holstein (nature reserve, 165,000 ha)  
North Sea coast of Niedersachsen (nature reserves, 60,000 ha)  
Baltic coast - Schleswig-Holstein (9 nature reserves - 1,500 ha and 2 game reserves - 52,500 ha)

Bodies of running water : 71 nature reserves of a total area of 13,612 ha as follows :

Elbe river (12 nature reserves, 2,800 ha)  
Weser river (5 nature reserves, 135 ha)  
Ems river (4 nature reserves, 220 ha)  
Rhine river (27 nature reserves, 7,750 ha)  
Main river (9 nature reserves, 297 ha)  
Danube river (7 nature reserves, 709 ha)  
Isar river (6 nature reserves, 972 ha)  
Inn river (1 nature reserve, 729 ha)

Natural lakes : 45 nature reserves of a total area of 10,144 ha and one game reserve of 1,178 ha, as follows :

Steinhuder Meer (4 nature reserves, 748 ha)  
Ostholfsteinische und Lakenburgische (12 nature reserves, 120 ha)  
Dummer ( nature reserves, 880 ha and 1 game reserve 1,778 ha)  
Maarseen der Eifel (12 nature reserves, 2,370 ha)  
Bodensee (7 nature reserves, 2,028 ha)  
Mindensee (7 nature reserves, 310 ha)  
Sudbayerische Seenplatte (7 nature reserves, 3,388 ha)

Artificial water bodies : 9 nature reserves of a total area of 1,810 ha, as follows :

Meibeudorfer Teiche (1 nature reserve, 750 ha)  
Riddaghauser Teiche (1 nature reserve, 475 ha)  
Mohuesse Teicher (2 nature reserves, 300 ha)  
Weisterwalder Fischteicher (5 nature reserves, 285 ha)

#### GREECE

There are 31 biotopes of importance, 12 of which are protected (6 aesthetic forests, 3 national forests ; Lake Prespa, Evros delta and Lesbos petrified forest).

#### IRELAND

21 biotopes of importance have been protected. These include 19 statutory nature reserves and 4 national parks. In addition, 70 wild-fowl sanctuaries have been created where the hunting of protected wild birds during the open season is prohibited.

#### ITALY

A long list of proposals has been submitted for approval to the national and regional authorities. Final decisions depend on the adoption of the Outline Law on national parks and nature protection, which has been submitted to Parliament with a list of 25 national parks, covering wetlands (including 15 marine parks). Some biotopes have been declared "wetlands of international importance" according to the Ramsar Convention.

#### LIECHTENSTEIN

160 ha of wetlands and 35 ha of ponds are fully protected. The government acquires privately owned land for optimum protection.

#### LUXEMBOURG

60 wetlands, all small (1 - 5 ha) have been noted for designation as nature reserves. Wherever possible, the State purchases private property situated in wetlands.

#### MALTA

Ghadira (brackish-salt water wetland) is legally protected since 1979 and a physical rehabilitation scheme was started in 1980 with the aim of converting it into a permanent nature reserve.

#### NETHERLANDS

The Wadden Sea, the eastern Schelde and Lake Grevelingen. Other areas (76,500 ha) are protected by integrated planning with emphasis on ecology (eg North Sea coastal waters, Lake IJssel, Lake Veluwe).

#### NORWAY

A total of 273 sites related to coastal areas, lakes and wetlands, covering an area of 84,500 ha, are protected. In addition, birds are protected in 50 lighthouse areas and in the Jaeren protected landscape area. A number of lakes, river systems and wetlands are also protected within existing national parks.

## PORTUGAL

There are many areas of importance for rare or threatened species of flora and fauna, on the mainland and in the Azores and Madeira archipelagos.

### Protected sites - protected biotopes

- A. Mainland
- Arrabida nature park (10,821 ha)
  - Estuary of Tejo nature reserve (14,563 ha)
  - Sado estuary nature reserve (22,890 ha)
  - St Jacinto dunes nature reserve (666 ha)
  - Coastal marshes of Sapal di Castro Marin (2089 ha)
  - Ria Formosa nature reserve (1600 ha)
  - Berlengas nature reserve (island) (78 ha)

Forestry areas along the coast enjoying special protected status

- permanent hunting reserves on coastal cliffs (16,200 ha)
- Sintra-Cascais protected area (23,275 ha)
- state forests (82 km)
- forest outskirts (51 km)
- natural forest (11 km)

#### Inland areas

- Boquilobo marshes nature reserve (529 ha)
- Monte da Barca and d'Argolada sluice-gates (388 ha)
- Mata di Medos botanical reserve (338 ha)

#### Fauna protection areas

- Rio Mondego, Tuela and Baceiro fishing area
- Lago Comprida fishing area and small lagoons of Serra da Estrela
- Fishing area of the catchment basin of the Rio Lima
- Rio Tamega fishery reserve
- Fishery reserve of the Rio Sever and of the Riviere das Trutas
- Permanent hunting reserves on coastal cliffs (16,200 ha)

### B. Azores Autonomous Region - coasts

- Monte Brasil protected area (Terceira island)
- Vila Franca de Campo nature reserve (St Miguel island)

### C. Madeira Autonomous Region

- Selvagens Islands nature reserve (200 ha)
- Madeira natural park (20,000 ha)

## SPAIN

There are three national parks (including 2 integral reserves) of about 100,000 ha and five nature parks. In addition, 36 sites are proposed as nature parks and controlled nature reserves when the appropriate legislation comes into force. There are also 17 areas of controlled hunting.

## SWEDEN

There are hundreds of areas protected as nature reserves or animal sanctuaries. Some are national parks and some are nature conservancy areas. The largest protected wetlands are the Sjaunja animal sanctuary (approximately 100,000 ha), the mires of Muddus national park (approximately 49,000 ha) and the Store Moss with Lake Kävsjön, Jönköping country (approximately 7,500 ha). Most reserves have a combined ecological and social purpose.

## SWITZERLAND

Important biotopes are included in the inventories :

- IFP (first series of 65 sites, all of which are included in the CPN inventory)
- CPN (125 sites, including 47 wetlands, covering 10% of the country)
- Leuzinger (includes 12 wetlands of international importance according to the Ramsar Convention)
- Riverside landscapes of national and international importance (9 sites of international and 21 of national importance).

The sites which are included in the CPN inventory and contain mainly wetlands are listed below :

Rivers, gorges falls :

Rhine at Laufen

Pichoux gorges

Doubs valley

Moutier gorges

Aar and Thielle backwaters

Valley of the Allodon and Moulin de Vert

Rhine falls

Thur

Reuss

Aar between Thun and Bern

Singine de la Schwarzwasser gorges

Rhine at Rhäzuns

Rhine gorges at Ruinaulta

Rhône at Finges

Maggia at Someo

Peatlands :

Ponts-de-Martel valley

Brévine valley

Haute-Versoix marshes

Neeracher Riet

Kaltbrunner Riet

Paludi del San Bernardino

Lake shores, ponds :  
Bonfol and Vendlincourt ponds  
Klingnau lake  
Joux and Haut-Jura valley  
Isle of St.Pierre/Bienne lake  
Right bank of Lake Neuchâtel  
Left bank of Lake Neuchâtel  
Slopes of Cortaillod and Bevaux (Lake Neuchâtel)  
Untersee (Lake Constance)  
Chatzensee  
Phäffikersee  
Lützelsee  
Frauenwinkel (Lake Zurich)  
Nuoler Ried (Lake Zurich)  
Halwilersee  
Burgäschisee  
Amsoldinger and Uebeschisee  
Lauerzersee  
Vierwaldstättersee  
Left bank of the Brienzersee  
Weissenau (Lake Thuner)  
Les Grangettes (Lake Lemand)  
Lake Zuger  
Tanay lake  
Oberengadinerseen  
Bolle di Magadino (Lake Maggiore)

#### TURKEY

There are three categories of protected areas : wetlands of international importance, coastal areas and lake shores,

Existing national parks : Kuscenneti, Yedigoller, Diler Peninsula, Munzur Valley, Olimpos Beydaglara (coastal), Koprulu Canyon. All the drinking water dams are also regarded as protected areas,

#### UNITED KINGDOM (GREAT BRITAIN ONLY)

A large number of lakes and other wetlands are protected as National Nature Reserves (NNR) or Sites of Special Scientific Interest (SSSI). Some of the largest protected areas are the tidal mudflats or wetland areas of the Dee, Severn and Dyfi estuaries.

Protection of rivers generally falls into two categories :

Protection category 1 concerns areas of great importance for the preservation of nature

Protection category 2 concerns areas of lesser importance

The following percentages of main river length belong to Protection category 1 ;

In England	1.5 % of main river length
In Wales	8.8 %
In Scotland	1.8 %

The following percentages of main river length belong to Protection category 2 :

In England	1.3 % of main river length
In Wales	3.9 %
In Scotland	0.3 %

Apart from the above, the following percentages of river length belong to the SSSI category :

In England	1.7 % of main river length
In Wales	4.7 %
In Scotland	-

A P P E N D I X 8

SELECTED PLANS AND PROGRAMMES

BELGIUM

Establishment of protected areas (see Appendix 7)

CYPRUS

- Contribution to Mediterranean Action Plan, MED POL (series of projects)
- Establishment of a protected turtle breeding area (see Appendix 7)

DENMARK

- Establishment on 50% of Danish coasts of the "Larger national nature areas" by the National Agency for the Protection of Nature, Monuments and Sites (Ministry of Environment)
- Establishment of other protected areas (see Appendix 7)
- The "Nature Conservation Plans" prepared by the regional authorities, showing how recreation activities may take place without damaging the natural environment of coastal areas

FRANCE

- "Picard report" (1972), proposed a series of measures to secure sound coastal management and to regulate use of a number of spaces open to the public. Five measures were set forth :
  - (i) The creation of the "Conservatoire du littoral" (Coastal and lake conservation agency, Act of 10 July 1975), with the task of carrying out a land policy of coastal protection respecting the natural and ecological balance
  - (ii) The protection of "sensitive perimeters" so delineated by the Départements, first priority of which were coastal areas
  - (iii) The development of coastal areas for leisure and nature as model cases following the principle of integrated management. These are :
    - east of Dunkirk in the north
    - Escaut in the Pas-de-Calais
    - Sallenelles in Calvados
    - Combrit in Finistere
  - (iv) Marine resource and seawater use plans, SAUM (Schémas d'aptitude et d'utilisation de la mer) are an extension to the marine environment of the General plan for land use.

The following SAUM were decided upon as pilot projects :

Bay of Brest  
Petruis Charentais  
Morbihan Gulf  
Bay of Hyères  
coast of Picardy  
delta of the Seine river  
St Briene Bay  
Arcarchon Bay

The two first plans have been completely carried out.

- (v) Preparation of regional coastal plans for areas under a special interministerial management scheme.  
The following five coastal regional plans have already been approved by the interministerial Committee for Regional Planning :

coast and islands of Brittany  
coast of lower Normandy  
coast of central western Atlantic  
upper Normandy coast  
Corsican coast

- The "Sea Development plans" optional in coastal areas, are drawn up by the State in cooperation with all interested occupational groups and associations. They establish the basic principles governing the protection, use and development of the coastline
- Permanent inventory of the littoral, data bank of the evolution of land use and its causes
- Establishment of protected areas (see Appendix 7)

#### FEDERAL REPUBLIC OF GERMANY

- The Wadden Sea special programme
- Establishment of protected areas (see Appendix 7)
- Determination of semi-natural areas in the densely populated Rhine Valley
- Integrated management programmes for the biotopes of the former "Techgut Wallnau/Fehmarn"
- Management of the Wollmatinger Ried-Untersee-Gnadensee nature reserve

#### GREECE

- Contribution to the Mediterranean Action Plan MED POL
- National coastal management programme
- Quality of coastal waters of Saronikos and Evoikos Gulf
- Establishment of protected areas (see Appendix 7)

#### IRELAND

- The National Coastline Study by An Foras Forbathar (National Institute for Physical Planning and Construction Research), which includes detailed guidelines for the protection and management of coastal areas.
- Establishment, since 1976, of an independent tribunal (An Bord Pleanala), which adjudicates on appeals from the decisions of planning authorities, according to the Local Government Act. It also deals with appeals under the Water Pollution Act (1977)
- Establishment of protected areas (see Appendix 7)



#### ITALY

- Full inventory for the purpose of selecting suitable coastal sites for nuclear power stations (1973)
- Contribution to the Mediterranean Action Plan, MED POL
- Establishment of protected areas (see Appendix 7)

#### LUXEMBOURG

- The first part of the Declaration of general intention of the plan for partial development concerning nature in Luxembourg was adopted by a Decision of the Government in Council (24 April 1981)
- The following are under consideration for the application of the relevant directives :
  - i. a law on the protection of the natural environment, completed by detailed provisions concerning nature parks, landscapes requiring protection, etc
  - ii. a special service, but with reduced staff
  - iii. the provision of the funds required for forests and nature reserves

#### NETHERLANDS

- The Water Action Programme
- The Wadden Sea special programme
- The eastern Schelde special programme
- The Delta-plan programme
- The Zuiderzeeproject, to determine whether the construction of another large polder would be worth the ecological damage caused
- Establishment of protected areas (see Appendix 7)
- Specific authorities or bodies specifically for coastal planning and management do not exist. There has been a gradual adoption of a system of water management by public and semi-public authorities. At the basis of this system is the "waterschap" which is a legal cooperation of landowners and tenants. These management authorities are under the supervision of the provincial governments "Provinciale Waterstaat". These are supervised at the national level by the Chief Directory of Waterstaat, assisted by the Rijkswaterstaat, which is in charge of the execution of major water defence and local reclamation projects.

#### NORWAY

- Comprehensive programme for reducing pollution, in particular the discharge of phosphorus into lakes and watercourses
- Detailed action plan adopted by the State, municipalities and oil companies, for an oil pollution control emergency system
- Establishment of protected areas (see Appendix 7)

#### PORTUGAL

- Establishment of protected areas (see Appendix 7)
- Studies on the characteristics of coastal areas for their planning
- Studies on the reclamation of the most degraded areas according to the principles of the European Coastal Charter

#### SPAIN

- The network for monitoring and observing the marine environment (ROM) was set up in 1976 to survey the quality of coastal waters
- The indicative plan for the use of the littoral (PIDU) for all the country with the exception of the Basque country
- Studies on the dynamics of the littoral (for all the Spanish coasts)
- National plan for ports for pleasure and sport
- Plans for the use of beaches and coastal areas
- Defence works and those for improving and renewing the coastline and beaches
- Statistical survey of the microbiological quality of coastal waters in the Malaga and Tarragona provinces
- Evaluation of the phenomena of dilution, dispersion and inactivation of bacteria in the waste waters discharged into the sea by submarine pipelines
- Establishment of protected areas (see Appendix 7)

#### SWEDEN

- The Swedish Marine Resources Commission has the task of
  - i. coordinating and studying the results of marine resources management ;
  - ii. initiating experiments dealing with marine questions in physical planning of four larger sea areas (Gothenburg and Behus coast, the Oresund area, the area north of the island of Gotland and the archipelago areas in the counties of Stockholm and Södermland)
  - iii. drafting an overall programme for marine resources activities
- The special programme for fighting oil pollution in coastal waters is the task of the Swedish Customs.
- Establishment of protected areas (see Appendix 7)
- Monitoring of water quality in rivers
- Monitoring of water quality in the great lakes
- Monitoring of water quality along the coast
- The Fjeld Study

#### SWITZERLAND

- Two studies concerning the shores of a Swiss lake :  
Plan for the protection of the south-east shore of Lake Neuchâtel by the Swiss League for the Protection of Nature (LSPN) and the WWF-Switzerland, financed by Pro Natura Helvetica 1980  
Study of the south shore of Lake Neuchâtel and the shores of Lake Morat
- Establishment of protected areas (see Appendix 7)

TURKEY

- Establishment of protected areas (see Appendix 7)
- Research and monitoring projects in coordination with the MED POL activities

UNITED KINGDOM (GREAT BRITAIN ONLY)

- "The Heritage Coast" special programme aims to protect and preserve outstanding coasts. It now covers about 40% of the total undeveloped coastline of England and Wales.
- "Enterprise Neptune" special programme aims to bring into the ownership of the National Trust (a voluntary body operating in England and Wales) important unspoiled areas. Today the National Trust has about 500 miles of coast, much of it of great scientific as well as scenic interest.
- The National Trust for Scotland owns some 35 miles of the mainland coast of Scotland and 60 miles on the Scottish islands. In addition 77 miles are protected by management agreements.
- Three national governmental agencies also play a significant part both in advising Government and in the management of the unspoiled coastline :
  - i. The Nature Conservancy Council, a statutory agency operating throughout Great Britain. It is consulted on development proposals and itself manages, or advises on the management of, reserves and protected areas. It also carries out detailed biological research and surveys
  - ii. The Countryside Commission, a statutory agency operating in England and Wales. Its main tasks are to promote conservation and enhancement of landscape beauty. It also has responsibility for providing for informal recreation in the countryside.
  - iii. The Countryside Commission for Scotland, a statutory agency operating in Scotland with tasks similar to those of the Countryside Commission.
- The management and protection of inland waters and of river banks or lake shores is the responsibility of Water Authorities
- Local authorities and voluntary organisations both manage some protected areas at the water's edge.

A P P E N D I X 9

SELECTED LEGAL MEASURES<sup>(1)</sup> DIRECTLY CONCERNING THE COASTAL OR RIPARIAN AREAS

AUSTRIA

- Federal Water Act
- Federal Navigation Act
- Nature Conservation Acts at the "Länder" level

BELGIUM

Wallonia's Order (1982)

CYPRUS

Shore Protection Act

DENMARK

- Governmental circular on the planning and development of holiday centres and summer house districts (referring to the delineation of coastal and riparian zones) 1981
- Conservation of Nature Act (1937, 1969)
- The above-mentioned circular and the Conservation of Nature Act are part of the overall Danish planning system that is mainly based on the National and Regional Act, the Urban and Rural Zones Act (1969) and the Municipal Planning Act.

FRANCE

- The development of coastal areas is the subject of a directive on regional planning, approved by the Decree of 25 August (1979)
- The Nature Protection Act (1976)
- With regard to land-use plans, the littoral is governed by three types of law :
  - i. that concerning the sea
  - ii. that concerning the state and local municipalities
  - iii. that concerning private property
- Decentralisation Act (1983)

FEDERAL REPUBLIC OF GERMANY

- Federal Nature Conservation and Landscape Management Act (Bundesnaturschutzgesetz, 20 December 1976)
- Regional nature conservation and landscape planning acts of the Federal Länder
- Regulations on protected areas, which are issued by the Länder on the basis of the pertinent acts

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(1) International conventions or Protocols ratified by each country, bilateral or other agreements are not included

#### GREECE

- The Shoreline and Coastal Zone Act (2344/1940)
- City and Country Planning Act (1337/1983)
- Marine Environment Act (743/1977)
- Different governmental circulars, etc.

#### IRELAND

- Foreshore Act (1933)
- Coastal Protection Act (1963)
- Oil Pollution of the Sea Acts (1956, 1977)
- Fisheries Acts (1959, 1962)
- Wildlife Act (1976)
- Local Government (Water Pollution) Act (1977)
- Local Government (Planning and Development) Acts (1963 to 1983)

#### ITALY

- A bill for the Protection of the Sea (1982)
- Regional Development Act (1971)
- Nature Parks and Reserves Bills (1979, 1982)

#### LUXEMBOURG

- Decision of the Government in Council of 24 April 1981, regarding the partial planning project for the natural environment and bearing in particular on the first part entitled "Declaration of general interest"
- Act of 11 August 1982 on the protection of nature and natural resources
- Act of 28 June 1976 on regulation of fisheries in inland waters
- Act of 16 May 1929 on cleaning, maintaining and improving watercourses
- Grand Ducal Regulation of 21 March 1980 to ensure sanitary protection of the dam near Esch-sur-Sûre
- Act of 20 March 1974 on regional planning

#### NETHERLANDS

- Coastal Defence Act
- Environmental Protection Act (1980)
- Nature Conservation Act
- Delta Act (1958)
- The Pollution of Surface Waters modified Act (1970, 1981)
- The Pollution of Seawaters Act (1977)

#### NORWAY

- Building and Planning Act (1965)
- Shore and Mountain Planning Act (1971)
- Open-air Recreation Act (1957)
- Act relating to motorised traffic in marginal land and watercourses (1977)
- Nature Conservation Act (1970)
- Act concerning waste and protection against pollution (requires also the environmental impact assessments in the case of planned activities of a certain size which may have a pollution impact) (1981)

#### PORTUGAL

- Legislative Decree on the legal definition of various types of protected areas (1976)
- Creation of the national agricultural reserve (1982)
- Creation of the national ecological reserve (1983)
- Regional planning norms (1983)
- Regulation on fisheries in inland waters allowing for the creation of fishing reserves (1962)
- Hunting regulation allowing for the creation of permanent hunting reserves (1967)
- Norms for the definition and creation of bird reserves (1979)
- Prohibition of extracting sand in coastal areas (1980)
- Regulation on extracting sand or gravel in rivers and on river banks (1982)
- Outline-law on the environment (bill) (1983)

#### SPAIN

- The Spanish constitution : the sea/land area, the beaches, are declared as belonging to the State
- The Coast Act (1969)
- The River Fishing Act (1942)
- The Water Act (1879)
- The Protected Natural Areas Act (1975)
- The Mountain Protection Act etc. (1908)
- The Law which set up the National Institute for Nature Conservation (ICONA) (1971)
- General Environmental Act (1983)

#### SWEDEN

- On the basis of the proposals outlined in the Government Bill on national physical planning (1972), Parliament laid down specific guidelines for land and water management in coastal areas also, where severe competition for physical resources was already or would soon be a reality. These guidelines in the form of a governmental circular have been addressed to all national authorities and they are to be followed in all decisions having a bearing on the management of Sweden's aggregate land, water resources, energy and wood-fibre raw material
- Nature Conservancy Act (1964)
- Nature Conservancy Ordinance (1976)

- Environmental Protection Act and Environmental Protection Ordinance (1969)
- Dumping Ordinance (1971)
- Act and Ordinance on measures against water pollution from vessels (1980)
- Building Act (1978)
- Water Act (1918)
- Water Association Act (1976)
- Forest Conservation Act (1979)
- Ordinance on forest conservation (1979)
- The Government Bill on the future national physical planning (1981) emphasised the central role of local authorities in future national planning.

#### SWITZERLAND

- Federal Act on the protection of nature and landscape (1966)
- Federal Act on regional planning (1979)

#### TURKEY

- Water Products Law (1973)
- Revised Law of Reconstruction (1975)
- The Protocol for the Protection of Surface Water Resources Use for Domestic Purposes against Pollution (1976)
- National Parks Law (1983)
- Environmental Law (1983)
- Foundation Act for the State Hydraulic Works Institution

#### UNITED KINGDOM (MOSTLY GREAT BRITAIN ONLY)

- National Planning Guidelines for the Coast (1974)
- Wildlife and Countryside Act (1981)
- Nature Conservancy Council Act (1973)
- National Parks and Access to the Countryside Act (1949)
- Coastal Protection Act (1949)
- Water Act (1973)
- Control of Pollution Act (1974)
- Salmon and Freshwater Fisheries Act (1975)
- Protection of Wrecks Act (1973)
- Land Drainage Act (1976)
- Countryside (Scotland) Act (1967)
- Town and Country Planning (Scotland) Acts (1945 to 1972)
- Local Government (Scotland) Act (1973)
- Various Government circulars

A P P E N D I X 10

DELINEATION AND PROTECTION OF COASTAL AREAS, RIVER BANKS AND LAKE SHORES

CYPRUS

In certain cases, all building along the coast is prohibited by the Cabinet. Such prohibitions may apply to land between the high-water mark and a point between 200 and 300 metres inland.

DENMARK

- Almost all areas within a distance of 3 km from the coast are included in the coastal area (Government circular, 1981)
- Establishment of new summer house districts in the coastal area is not allowed (Government circular, 1981)
- The free access to almost all beaches, even to beaches bordered by privately owned land, is secured (Conservation of Nature Act, 1968)
- Construction of houses, alteration of the ground, planting, etc within a distance of 100 m of the coastline is subject to approval by local conservation board (Conservation of Nature Act, 1937)
- Possible limitation of yatching along threatened coasts, especially for motor boats (Conservation of Nature Act)

FRANCE

- The shore (limited by the highest tidemark of the year), the foreshore (since 1963), the salt water lakes communicating with the sea, ports and roadsteads are included in the "Domaine public maritime (DPM)"
- Private property is extended over the DPM
- Public access to the coastal strip, only for pedestrians, is secured by a way 3 metres wide and parallel to the shore that runs the full length of the DPM
- Building is prohibited outside existing built-up areas or land earmarked for development, in a currently valid planning document, for the preservation of yet unspoilt landscapes and agricultural land
- In areas earmarked for development, land within 100 metres from the shoreline must be fully protected and building is prohibited, with the exception of public service facilities and activities that have to be sited on the sea or lakes (harbour facilities, power stations)
- The previous prohibition refers also to camping and caravan sites and to simple recreational accommodation
- Control of extraction of sand and gravel
- Prohibition of new routes of the road network within at least 2000 metres from the shoreline

FEDERAL REPUBLIC OF GERMANY

- Provisions on the utilisation of protected river banks, lake shores and coastal areas are contained in the Federal and Länder acts on nature conservation and landscape management, as well as the regulations on protected areas (see Wadden Sea report).



#### GREECE

- Shoreline (aegialos) is defined as that land area adjacent to the sea which at high tide and normal weather would be covered by the seawaves
- Coastal zone (paralia) is defined as that zone of unbuildable land up to 20 metres inland, starting from mid-level of the shoreline (as defined above). This is added in circumstances where the geomorphy of the adjacent land makes access to the sea and vice versa difficult or impossible
- The shoreline is of public interest, belongs to the State and its protection and management is secured by it
- In areas outside the boundaries of towns and smaller settlements before 1923, and within a zone of 500 m width from the sea shoreline or the lake shoreline, fencing is not allowed
- For the benefit of the public, the expropriation of land is permitted in order to secure access to the beach for the public, as well as for the provision of the necessary parking spaces
- The removal of sand from the beaches is allowed at selected points with the permission of the Local Authorities concerned

#### IRELAND

Under planning legislation, local authorities may make provision in their development plans for the protection of rights of way to the seashore, lakes, rivers and other places of natural beauty and recreational utility. Rights of way may also be created by agreement or compulsorily

#### ITALY

No building permit will be granted until local development plans of certain regions (eg Friul-Venezia-Giulia) have been approved.

#### NETHERLANDS

- Due to its geophysical structure, the greater part of the Netherlands is considered as coastal area. It is evident that a general prohibition, concerning building or other activities in the coastal area, would be an unrealistic policy since this country follows a land reclamation policy for urbanisation. However, most elements of coastal planning against storm surges, beach protection, water management and land reclamation are embedded in the "normal" system of planning.
- The greater part of the land bordering the coastline is already under governmental possession or control
- Sand extraction is only allowed (because of possible erosion of the coast) outside the 20 metre isobath, except where navigation channels have to be dredged
- Dredging is not allowed within one mile of submarine cables and is restricted in shipping lanes

#### NORWAY

- All new construction lying closer to the shoreline than 100 metres is excluded (Shore and Mountain Act, 1971)
- All citizens have the right to move freely to the coast, regardless of ownership (Open-air Recreation Act, 1975)
- There are regulating provisions for the use of motorised vehicles (Act relating to the Motorised Traffic in marginal land and watercourses, 1977)

#### PORTUGAL

Creation of permanent reserves on coastal cliffs, first of 250 - 300 metres large, more recently of up to 1,000 metres, for the protection of game in these areas (see Appendix 7)

#### SPAIN

Free access to the sea is secured by ways perpendicular to the shore.

#### SWITZERLAND

- The vegetation of the banks must not be pulled up, covered over or destroyed in any other way ; some exceptions may be authorised, but only in the public interest (Art. 21 and 22 of the 1966 Federal Act on the protection of nature and landscape)
- Any authority responsible for regional planning must respect the principle of leaving the shores of lakes and the banks of watercourses free and facilitating public access to them ; plans for land use must delineate watercourses and lakes, and their banks, among the areas to be protected (Art. 3 and 17 of the 1979 Federal Act on regional planning)

#### SWEDEN

- "Protected shore" is a zone up to 300 metres inland and 100 metres into the water from the shoreline of coasts, lakes and watercourses (Nature Conservancy Act, 1964)
- New development is generally prohibited within 100 metres inland and offshore along all the coastline and for long stretches of the coastline this prohibition extends to 300 metres (Nature Conservancy Act)

#### TURKEY

In order to secure public access to the sea, lake, river within a zone of 30 metres in the direction of land from the natural contour line, indicating the level zero, determined as part of the country-wide surveying network, structures or barriers such as walls, hedges, railings, ditches, etc. are not permitted on coasts and on coast strips which are narrower than 30 metres (Revised Reconstruction Law, 1975)

UNITED KINGDOM (GREAT BRITAIN ONLY)

The width of the protected coastal area is defined in England and Wales by the Country and local planning authorities and in Scotland by the Regional and District planning authorities in their physical planning, based on some fundamental criteria such as the land area visible from the coast, the land use, the ecological character and value.

A P P E N D I X 11

EDUCATION, INFORMATION, RESEARCH AND MONITORING

COUNTRY	EDUCATION		INFORMATION	RESEARCH	MONITORING
	Primary, Secondary	Higher			
AUSTRIA	E, C	E, C	I	R	S
BELGIUM	E	E, C	I	R	S
CYPRUS					S
DENMARK	N	N	N	N	N
FRANCE	E, C	E, C	I	R	S
FED. REP OF GERMANY	E	E, C	I	R	S
GREECE	C	E, C		R	S
IRELAND	E, C	E, C	I	R	S
ITALY	E	E, C	I	R	S
LIECHTENSTEIN	C	C	I		
LUXEMBOURG	C		I	N	N
MALTA		C	I	R	S
NETHERLANDS	E, C	E, C	I	R	S
NORWAY	E	E, C	I	R	N
PORTUGAL	E	E, C	I	R	S
SPAIN	E	E, C	I	N	N
SWEDEN	E, C	E, C	I	R	S
SWITZERLAND	E	E, C	I	R	N
TURKEY	C	E, C		R	S
UNITED KINGDOM	E, C	E, C	I	R	S

E. Advanced Environmental Education  
 C. Special Courses  
 I. Advanced Information Systems  
 R. Advanced Research Programmes  
 S. Advanced Monitoring Systems  
 N. Not available

A P P E N D I X 12

ACTIONS AND AGREEMENTS AT INTERNATIONAL LEVEL

1. Global actions taken by European institutions

- Council of Europe Resolution (73) 29 of the Committee of Ministers on the protection of coastal zones (26 October 1973)
- 1st Conference of European Island Regions (CLRAE) April 1981
- 6th session of CEMAT (Torremolinos, 1983). The planning of European coastal regions
- 4th European Ministerial Conference on the Environment (Athens, April 1984) on coastal areas, river banks and lake shores
- OECD Recommendation of the Council of 22 October 1976 on the principles relating to the administration of coastal zones
- EEC Summary of the studies undertaken on the improvement and administration of the coastline
- Support of the European Coastal Charter, Resolution 201, 23 June 1982 of the European Parliament

2. Detailed action of the EEC

- Decision of Council of 3 March 1975 on the prevention of pollution of the sea from land-based sources
- Directive of 4 May 1976 concerning pollution caused by dangerous substances dumped at sea
- Directive of 8 December 1975 concerning the quality of water for bathing
- Decision of Council of 25 July 1977 on the protection of the Mediterranean
- Directive of 20 February 1978 relating to waste from the dioxide of titanium industry
- Resolution of Council of 26 June 1976 instituting an EEC action programme concerning control and reduction of pollution caused by the dumping of hydrocarbons at sea
- Recommendation of Council of 26 June 1976 relating to the ratification of the Marpol and Solas agreements (of IMO)
- Directive on the quality of fresh waters needing protection or improvement in order to support fish life
- Directive of Council of 21 December 1978 relating to the piloting of ships in the North Sea and the English Channel

. Protection of the Baltic

Gdansk, 13 September 1973  
Helsinki, 22 March 1974

. Protection of the Mediterranean

Barcelona, 16 February 1976  
Athens, 17 May 1980

- Directive of Council of 21 December 1978 relating to minimum conditions demanded of oil tankers entering the ports of EEC
- Recommendation of Council of 21 December 1978 relating to the ratification of the London agreement of July 1978 on the standards for the training of seamen, awarding of certificates and for monitoring
- Directive of Council of 30 October 1979 relating to the quality required in shellfish breeding waters
- Regulation on the common rules for imports of whales or other cetacean products
- Decision establishing a Community information system for the control and reduction of pollution caused by hydrocarbons discharged at sea
- Decision concerning the conclusion of the Convention on the conservation of European wildlife and natural habitats
- Directive of 22 March 1982 on limit values and quality objectives for mercury discharges by the chlor-alkali electrolysis industry
- Decision on the conclusion of the Convention on the conservation of migratory species of wild animals
- Regulation on the implementation in the Community of the Convention on international trade in endangered species of wild fauna and flora
- Resolution of the Council of the European Communities and of the Representatives of the Governments of the Member States meeting within the Council on the continuation and implementation of a European Community policy and action programme on the environment (1982 - 1986)
- Resolution concerning the combating of water pollution
- Decision concluding the Protocol for the protection of the Mediterranean Sea against pollution from land-based sources
- Directive concerning the importation into Member States of skins of certain seal pups and products derived from them

3. Principal international agreements relating to the preservation of the marine environment

3.1 At international level (summarised theme)	Agreement of
- Pollution by hydrocarbons	London, 12 May 1954
- Codification open sea	Geneva, 19 April 1958
- Codification continental shelf	Geneva, 29 April 1958
- Nuclear vessels	Brussels, 25 May 1962
- Pollution by hydrocarbons	Brussels, 29 November 1969
- Action on open sea in case of tanker accident	Brussels, 29 November 1969
- Extension to other substances of the Brussels agreement of 29.11.69	Draft of London, 2 Nov. 1973
- Dumping by ships	Oslo, 15 February 1972
- Dumping of waste	London, 29 December 1972
- Telluric pollution	Paris, 4 June 1974
- Safety on vessels	Marpol, (IMCO) 1973 revised 1978
- Qualification of crew members	Solas, (IMCO) 1974 revised 1978
- Standards of work on ships	ILO 147, 1978
- Training of seamen, certificates and monitoring	London, July 1978
- Protection of wetlands	Ramsar, 2 February 1971
- World Cultural and Natural Heritage	UNESCO, Paris, 16 Nov. 1972
- International trade in threatened species	Washington, 1973
- Protection of migratory species	Bonn, 23 June 1979
- Conservation of European wildlife	Bern, 19 September 1979
- Law of the Sea	Montego Bay, 10 December 1982
3.2 Regional level (summarised theme)	Agreement of
- Protection of the North Sea	Bonn, 9 June 1969
- Protection of the Baltic	Copenhagen, 16 September 1971
	Gdansk, 13 September 1973
	Helsinki, 22 March 1974
- Protection of the Mediterranean	Barcelona, 16 February 1976
	Athens, 17 May 1980

4. Other international texts :

World Charter for Nature	Adopted by the UN General Assembly on 28 October 1982
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A P P E N D I X 13

LAND POLICIES

List of selected tools and policies related to the management of land

1. Planning instruments
  - public planning
  - building prohibitions, restrictions
2. Taxation Instruments
  - property taxes on real estate
  - annual site value taxes
  - taxes on the increment in land value
  - taxes on building rights
  - exemption from taxes when land is sold to public authorities
  - development charges
3. Market Instruments
  - land acquisition in the open market
  - exchange of land
  - selling of land
  - making use of private, semi-public development companies
4. Financial Support Instruments
  - land acquisition loans or subsidies to local authorities
  - special conditions for loans for land acquisition
  - compensation payment by state or municipal bonds
5. Administrative Instruments
  - nationalisation or municipalisation of land
  - compulsory handing over of public areas to the local authority without compensation
  - recapture of unearned increment in expropriation
  - limitation of land acquisition rights
  - regulation of land prices
  - pre-emption rights
  - compulsory replotting
  - laws to protect areas of natural beauty and of historic value
  - land banks (at national, regional, local levels)
  - land pooling
  - land leasing
  - land register
  - proper valuation of land
  - competent staff and effective administration in land questions
  - land policy programmes for local authorities
  - research in the field of land policy



A P P E N D I X 14

COAST DEPENDENT ENERGY FACILITIES

1. Facilities which use the indigenous energy resources of the coastal zone
2. Facilities which serve as a transfer point between sea and land
3. Facilities which transmit or transport energy from a transfer point of another energy facility located in the coastal zone to an inland site or another coastal site
4. Facilities which store energy necessary for transshipment, for surge storage, or to supply coastal energy facilities and maritime industries

A P P E N D I X 15

NUTRIENT STATE OF LAKES AND WETLANDS (1)

Nutrient status	Alkalinity (ppm $\text{CaCO}_3$ )	Water colour	Productivity
Dystrophic	0-2	Brown, peat stained	Extremely low, plants limited by lack of nutrients and lack of light penetration
Oligotrophic	0-10	Clear	Low, plants limited by lack of nutrients
Mesotrophic	10-30	Slightly green algal coloration in summer	Moderate to high, some oxygen depletion may occur in the hypolimnion of deeper examples
Eutrophic	>30	Often discoloured by algae	High, both for algae and macrophytes. Oxygen depletion occurs in hypolimnion of deep examples
Marl (calcareous)	>100	Extremely clear	Extremely low phytoplankton production, but high macrophytic production
Brackish	(Conductivity > 500 $\mu\text{mhos}$ . Sodium main cation)	Usually clear	Variable but phytoplankton generally sparse

(1) Handbook for the identification and evaluation of wetlands with a view to their protection, Council of Europe, revised version

# A P P E N D I X 16

## LIST OF SOME THREATENED EUROPEAN TAXA AND SPECIES IN COASTAL AND RIPARIAN AREAS

### PLANTS

#### Coastal strip

* <i>Anchusa crispa</i>	F (Corsica), I (Sardinia)
<i>Armeria soleirolii</i>	F (Corsica)
* <i>Astragalus maritimus</i>	I (Sardinia)
* <i>Astragalus verrucosus</i>	I (Sardinia)
* <i>Brassica macrocarpa</i>	I (Sardinia)
* <i>Calendula suffruticosa</i> spp <i>maritima</i>	I (Sicily)
* <i>Centaurea heldreichii</i>	GR
* <i>Centaurea horrida</i>	I (Sardinia)
* <i>Euphorbia hierosolimitana</i>	GR
* <i>Galium littorale</i>	I (Sicily)
* <i>Kochia saxicola</i>	I
<i>Limonium paradoxum</i>	IRL.GB*
<i>Linaria hellenica</i>	GR
<i>Muscari dionysicum</i>	GR
* <i>Salicornia venata</i>	I
<i>Silene velutina</i>	F (Corsica), I (Sardinia)
* <i>Symphytum cycladense</i>	GR

#### Freshwaters

<i>Aldrowanda vesiculosa</i>	CH, F*, D*, I
* <i>Angelica heretocarpa</i>	F
* <i>Aster pyrenaeus</i>	F
<i>Eleocharis carniolica</i>	I
* <i>Leontodon siculus</i>	I (Sicily)
* <i>Oenanthe conioides</i>	B, D

### ANIMALS

#### FRESHWATER FISHES

* <i>Acipenser sturio</i>	F, E, Danube basin area
* <i>Alburnoides bipunctatus</i>	B, NL, D, F, A, CH, GR
* <i>Alosa alosa alosa</i>	From Norway to the Mediterranean
* <i>Aspius aspius</i>	D, S, GR
* <i>Corregegonus albula</i>	F, D, GB, IRL, N, S
* <i>Corregegonus lavaretus</i>	CH, DK, I, GB, N, S
* <i>Corregegonus nasus</i>	DK, N, S
* <i>Corregegonus peled</i>	DK, F, S
<i>Cyprinus carpio</i>	Danube basin area
* <i>Gymnocephalus schraester</i>	A (Danube basin area)
* <i>Hucho hucho</i>	Danube basin area
* <i>Huso huso</i>	I (Po river), GR
* <i>Lampetra fluviatilis</i>	GB, I, IRL, N
* <i>Leuciscus idus</i>	S, B, DK, NL, GB, CH?, A?
* <i>Leuciscus souffria</i>	D, CH, A, I
<i>Pararutilus frisii meidingeri</i>	
* <i>Salmo salar</i>	B, DK, E, F, GB, GR, N, NL, S
* <i>Salmo trutta lacustris</i>	CH, GB, IRL, Scandinavian countries

Salmo trutta trutta  
 \*Salvelinus alpinus  
 \*Umbra krameri  
 \*Zingel asper  
 Zingel streber  
 \*Zingel zingel

E, N, S, D, DK, NL, B, GB, IRL, F,  
 N, S, GB, IRL, F, I, A  
 A, Danube basin area  
 F, D  
 D, A  
 A (Danube basin area)

#### AMPHIBIANS AND REPTILES

Proteus anguinus  
 Bombina variegata  
 \*Pelobates fuscus insubricus  
 Bufo calamita  
 \*Rana latastei  
 Emys orbicularis  
 Mauremys caspica leprosa  
 Caretta caretta caretta  
 Elaphe longissima longissima  
 Vipera aspis aspis

I  
 A, F, D, I, L; FL, NL, S  
 I, CH  
 B, DK, F, D, E, P, CH, GB\*  
 CH, I  
 CY, F, D, I, P, E, S, CH  
 P, E  
 F, GR, I, TR, GB, E  
 F, I, E, CH  
 F, E, CH

#### BIRDS

\*Acrocephalus palucidola  
 Anas strepera  
 \*Anser erythropus  
 \*Arenaria interpres  
 \*Aquila clanga  
 \*Buteo rufinus  
 \*Egretta alba  
 \*Falco peregrinus  
 \*Fulica cristata  
 Halcyon smyrnensis  
 \*Heliastur albicilla  
 \*Hieraetus fasciatus  
 Holopterus spinosus  
 \*Geronticus eremita  
 \*Larus audouinii  
 \*Oxyura leucocephala  
 \*Pelecanus crispus  
 \*Pelecanus onocrotalus  
 \*Phalacrocorax pygmaeus  
 \*Plegadis falcinellus  
 \*Porphyrio porphyrio  
 \*Pterocles alchata  
 \*Pterocles orientalis  
 \*Sterna dougallii  
 \*Tadorna ferruginea

A, D  
 D, DK, F, GB, GR, I, IRL, NL  
 GR, N, S, TR  
 D, DK, F, NL  
 F, GR, I  
 GR, TR  
 A, GR, TR  
 All Europe except B, DK, NL  
 P, E  
 TR  
 A, DK, F, I, ISL, IRL, N, S  
 F, GR, I, P, E, TR  
 GR  
 A, TR  
 CY, F, GR, E, TR  
 F, GR, I, TR  
 GR, TR  
 GR  
 GR, TR  
 A, F, GR, I, TR  
 GR, E  
 F  
 P, E, TR  
 D, F, GB, GR, IRL  
 GR, E, TR

#### Legend

\*Species characterised as endangered

A	Austria	F	France	L	Luxembourg
B	Belgium	FL	Liechtenstein	N	Norway
CH	Switzerland	GB	United Kingdom	NL	Netherlands
CY	Cyprus	GR	Greece	P	Portugal
D	Federal Republic of Germany	I	Italy	S	Sweden
DK	Denmark	IRL	Ireland	TR	Turkey
E	Spain	ISL	Iceland		

## A P P E N D I X 17

### Definition of coastal areas, river banks and lake shores

The terms "coastal area", "river bank" and "lake shore" cover marginal waters (including the land they cover or contain), and the adjacent land (including the water it contains or encloses) and between which there is an important interaction (Clark, 1977).

One can distinguish intertidal zones, transitional areas, salt marshes, lagoons, beaches, estuaries, deltas, freshwater marshes, wetlands, rocky coasts, dunes and flood plains, plus canals and reservoirs.

Aquatic and terrestrial areas are defined by the extent of the characteristic coastal ecosystems which are significantly modified by human activities (construction of ports, leisure pursuits, fishing, discharge of domestic waste waters and industrial effluents, etc) or by physical phenomena (deposit of earth, sand, rocks, etc, floods, wave action, and so on).

## G L O S S A R Y

### Anadromous:

Oceanic or estuarine fish species that enter fresh waters to spawn.

### Aquaculture:

is the use of a permanently inundated water area, whether saline or fresh for the purposes of growing and harvesting plants or animals in a way to promote more rapid growth, reduce predation, and increase harvest rate.

### Aquifer:

A geologic stratum that contains water that can be economically removed and used for human purposes.

### Back dune:

A stable dune behind the shifting frontal beach dune, often characterised by heavier vegetation.

### Bay:

A large estuary with a relatively high degree of flushing.

### Baseline:

1. A survey line the length and position of which is very accurately measured, used as a basis for subsequent triangulation surveys.
2. In the case of an estuary or bay, a line joining low water marks at the extremity of opposite headlands and from which the limits of the territorial sea are measured.
3. Applied to an investigation of the dynamics of an ecosystem in its (a) natural or (b) existing state to establish the conditions against which changes due to man's interference can be measured.

Benthos:

The community of bottom-dwelling life.

Brackish water:

Fresh water diluted with a small amount of salt water.

Buffer area:

A limited use area separating a developed area from a protected area.

Coastal:

Of or pertaining to the seacoast; specifically, the waters, margins or shorelands of estuarine basins, and the nearshore ocean.

Coastal waters:

As a management definition, territorial or interior waters that contain a measurable quantity or percentage of seawater.  
(eg more than 0.5 parts per thousand)

Coastal watershed:

A drainage basin that drains directly into coastal waters; excludes drainage basins that drain wholly into freshwater channels tributary to coastal waters.

Dams and impoundments:

Dams and impoundments are structures that obstruct natural water flow patterns for the purpose of forming a contained volume of water. Impoundments include dikes with sluice gates and other structures to control the flow of water.

Diffusion:

General transport of pollutants or other by turbulence.

Drainage basin:

The entire area of shorelands drained by a single watercourse and its tributaries.

Dredging - new:

New dredging is the removal of sediment from the bottom of a water body that has not been previously dredged or excavated, for the purpose of increasing water depth, or the widening or deepening of navigable channels to a newly authorised depth or width.

Dumping (solid waste or sludge):

The dumping of solid waste or sludge is the discharge of solid or semi-solid waste material from industrial or domestic sources or sewage treatment operations into a water area.

Dunes:

Accumulations of sand in ridges or mounds landward of the beach berm formed by natural processes and usually parallel to the shoreline.

Dystrophic:

A term applied to water bodies containing a high concentration of organic matter such as humic acid, but which are poor in nutrients.

Erosion:

The weathering and displacement of rock and soil by the force of moving water, wind and gravity.

Estuary:

A confined coastal water with an open connection to the sea and a measurable quantity of salt in its waters.

Eutrophic:

A term applied to waters rich in plant nutrients which are characterised by high primary productivity.

Eutrophication:

The enrichment of natural waters, especially by compounds of nitrogen and phosphorus, resulting in increased productivity.

Filling:

The deposition of inorganic material (sand, soil, earth, dredge spoils, etc) into water areas for the purpose of raising water bottom elevations.

Floodplain:

The area of shorelands extending inland from the normal yearly maximum stormwater level to the highest expected stormwater level in a given period of time (ie 5, 50, 100 years).

Inter-tidal zone:

Zone between high and low tide marks, often referred to as littoral zone.

Lagoon:

A relatively shallow estuary with very restricted exchange with the sea and no significant freshwater inflow.

Littoral:

Of or pertaining to the shore, especially of the sea; coastal.

Littoral drift:

The movement of sand by littoral (longshore) currents in a direction parallel to the beach along the shore.

Littoral zone:

The part of the ocean immediately adjacent to the shore.

Marshes:

Wet areas with predominantly grasslike vegetation.

Mesotrophic:

Applied to waters which are in the middle range of nutrient enrichment and productivity between oligotrophic and eutrophic.

Nursery area:

A place where larval, juvenile, or young stages of aquatic life concentrate for feeding or refuge.

Plankton:

Small suspended aquatic plants or animals that passively drift or swim weakly.

Photic zone:

The zone of the sea where light penetration is sufficient to allow photosynthesis. The euphotic zone is the zone in which light penetration is sufficient to allow photosynthesis production to exceed respiratory breakdown.

Runoff:

Runoff is that portion of precipitation on the land from rain, snow or human activity that ultimately reaches water bodies.

Salinity:

A measure of the quantity of dissolved salts in sea water, in ppt, parts per thousand of water.

Salt marsh:

A tidal wetland supporting salt-tolerant vegetation.

Saltwater intrusion:

A movement of salt water inland through soils into freshwater aquifers.

Sediment:

Material (such as clay, silt, sand, gravel, organic matter, and debris) deposited by water, wind or glaciers.

Sedimentation:

A process involving the settling or deposition of particles of material such as eroded soils that are suspended in water or being moved by it.

Shorelands:

The terrain of the coastal watershed down to the upper margin of the wetlands (lower margin of coastal floodplain).

Soil erosion and sedimentation:

Erosion is the detachment and movement of soil or rock particles by water, wind, ice or gravity, while sedimentation is the action or process of depositing soil or rock particles.

Suspended solids:

Particles of material suspended in water, including plankton, organic detritus, and sediment.



Tide:

The gravitational effect of the moon, and in a lesser degree of the sun, on the waters of the earth, by which they tend to become heaped up at the point below the moon, and at the opposite point to this on the earth, so that twice in each lunar day there is an alternate inflow and outflow on the shores, modified by local configuration. Ebb tide: a falling or low tide. Flood tide: the incoming or rising tide, the tide at its highest point.

Tideflat:

An unvegetated intertidal area.

Tide rip:

A shearing of two adjacent currents causing a noticeable surface discontinuity.

Trophic:

Of or pertaining food or feeding.

Turbidity:

Reduce water clarity resulting from the presence of suspended matter.

Waterfowl:

Of the family Anatidae; includes swans, geese, ducks, brant; the "game birds".

Watershed:

That portion of landscape from which drainage supplies a waterway.

Wetlands:

Wet vegetated areas. Coastal : naturally vegetated areas between mean high water and the yearly normal maximum flood water level.